3.8 Aesthetic and Visual Impacts

The Federal Highway Administration's (FHWA) Technical Advisory T6640.8A (TA) dictates that whenever a potential for visual impacts exists from a proposed transportation project, the environmental study should identify the potential visual impacts to the adjacent land uses as well as measures to avoid, minimize, or mitigate these potential visual impacts.

The visual assessment process consists of four study components. These include:

- Determining the existing Landscape Viewshed
- Analyzing the Landscape Character and Experience
- Predicting Baseline Impacts
- Identifying Mitigation Options

The visual assessment process provides an analysis of the landscape character for the Study Area. It is also used to determine the type and degree of visual impact for various viewers, such as the interstate/plaza user, the recreational tourist and the local resident.

The exact appearance of each Build Alternative is still conceptual. The development of Context Sensitive Solutions (CSS) has been an ongoing part of the study process to date. The Study Team has held ongoing public consultation and has examined conceptual ideas for buffer zones and wall types. The Study Team plans to hold a series of CSS workshops during the final EIS process.

What Are Context Sensitive Solutions (CSS)?

FHWA defines CSS as "a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist."

3.8.1 What does the Existing Study Area Look Like?

The Study Area and surroundings are best described (from east to west) as an urban area that begins transitioning to a more suburban less populated area as the viewer proceeds west through the study corridor. Residential and commercial properties are the most dominate land uses in the Study Area. Single-family homes make up the majority of the residential land uses, while business properties are prevalent along Pine Grove Avenue and near the Water Street Interchange. Public land uses include parks, a public campground, and a Michigan Welcome Center, all located west of the Black River Bridge.

Area Around Existing Plaza

The Study Area is mostly flat with the exception of the Black River and Stocks Creek crossings which are low lying areas. The area around the Black River gently slopes toward the river creating a visual experience that differs from the rest of the corridor. The western edge of the Study Area past the Water Street Interchange, which includes Stocks Creek, exists in more of a natural state than the remainder of the corridor. There are small woodland areas along with open areas of old fields and meadows. As one approaches Port Huron from the west, the trees and natural features are replaced with signs, billboards, power lines, streetlights, and commercial businesses.

There are a few key land uses within the Study Area that contribute to the visual identity of the area. The most significant of these are the Black River, adjacent marinas and parks. A public campground, owned and operated by Port Huron Township, is located on the north side of the freeway west of the Water Street Interchange. Residences are an important land use near the existing plaza. Their view includes an elevated plaza approximately 24-feet high with associated buildings and traffic. In the area dedicated to the new plaza in Port Huron Township, there are single-family residences located to the north and south of the existing freeway, a mobile-home park located further southwest, a large church located north of the freeway west of Stocks Creek, and a school located south of the freeway west of the Lapeer Connector. Residences in the Township area currently do not have a view of the existing plaza, but do have a view of the I-94/I-69 freeway and the associated traffic.

The visual quality of an area may depend on the preferences and subjective values of the viewer. FHWA produced a manual titled Visual Impact Assessment for Highway Projects to assist in evaluating the visual qualities of a Study Area.

In order to complete the analysis, the Study Area was divided into four areas that display consistent visual characteristics and a uniform visual experience which are called "Visual Assessment Units" (VAU). Each VAU may be thought of as outdoor room that has a direct relationship to the natural layout of the area and associated land uses. The boundaries of these visual environments occur where there is a change in visual character. The strongest determinations of the visual

boundaries are topography and landscape components. The four VAUs **(Figure 3.8.1)** within the Blue Water Bridge Plaza corridor have the following characteristics and include:

- **VAU-1, Port Huron Township** – This VAU consists of generally old field/meadow with some woods and low lying areas. Several billboards along with powerlines and a MDOT maintenance building make up the landscape. There is a cluster of single-family residences visible in the distance to the north and a mobile home park located just off of I-94/I-69 to the southwest.
- **VAU-2, Water Street/Lapeer Connector Area** – The area in and around this VAU consists of gently rolling terrain that is dominated by constructed elements. As the viewer travels from west to east, through this VAU, the area transitions from a rural to urban landscape. Views from I-94/I-69 are of billboards and signs promoting local businesses.
- **VAU-3, Black River Area** – The sloping terrain of the Black River constitutes VAU-3. The dominant feature in this VAU is the I-94/I-69 crossing of the Black River. The crossing is surrounded by marinas, public parks, several residences, a condominium building, and commercial establishments that overlook the river valley.
- **VAU-4, Existing Plaza Area** – The visual center of this VAU is the existing Blue Water Bridge Plaza. The elevated plaza dominates the views in this VAU. The plaza itself eliminates most of the views from the street level surrounding the plaza. However, there are excellent views of the surrounding neighborhoods and businesses from the plaza.

Highway median in VAU-1

I-94/I-69 in VAU-2

View of the Black River Bridge in VAU-3

View from Plaza in VAU-4

The visual quality rating of the visual environment in each VAU can be collectively defined using the attributes of vividness, intactness and unity—each of which is evaluated independently. The visual landscape is also divided into three parts for the evaluation:

- Foreground zone – 0.25 to 0.5 miles from the viewer,
- Middle ground zone – extends from the foreground zone to three to five miles from the viewer,

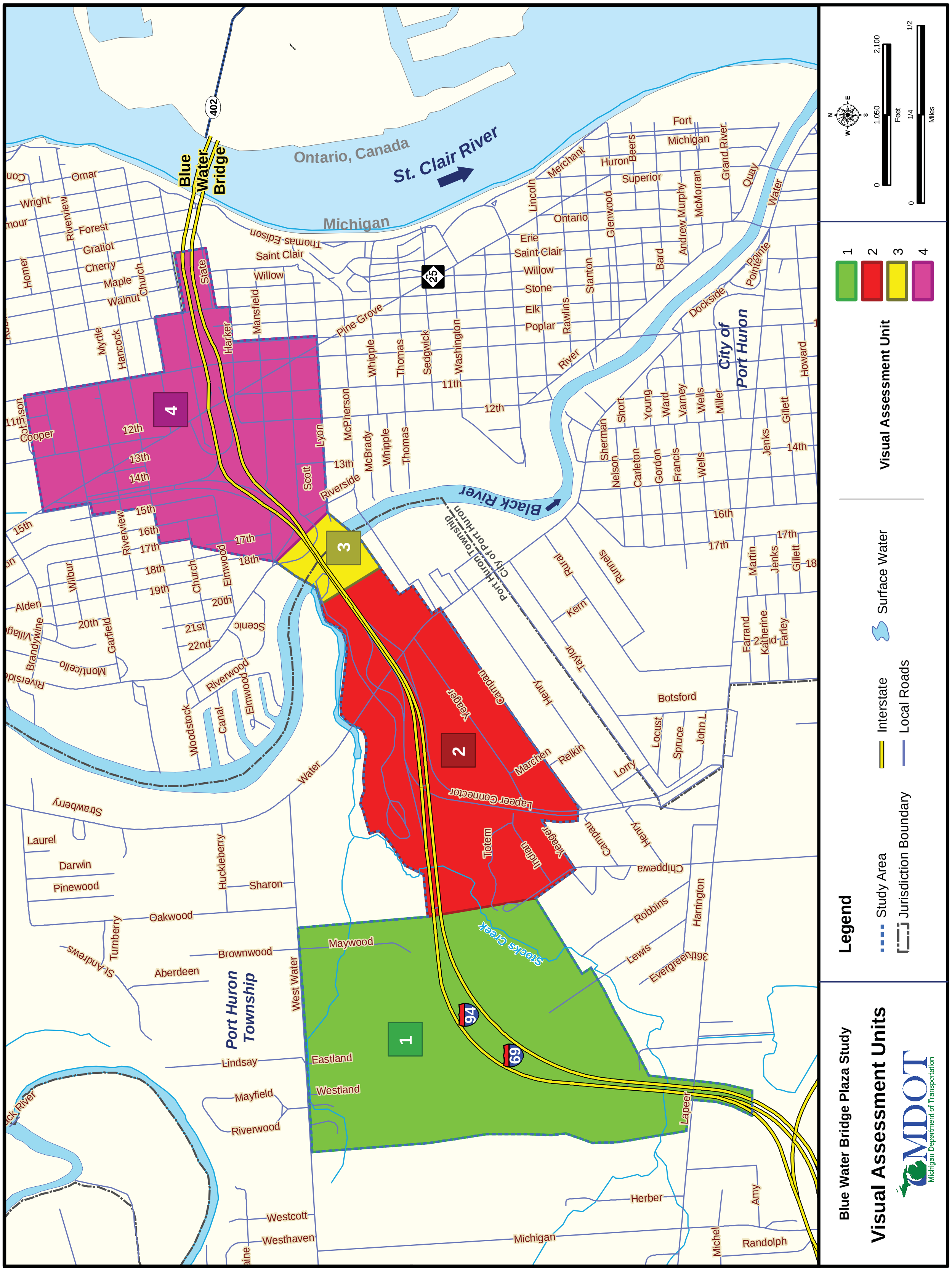

Blue Water Bridge Plaza Study
Visual Assessment Units
MDOT
Michigan Department of Transportation
Legend
Study Area
Jurisdiction Boundary
Interstate
Local Roads
Surface Water
Visual Assessment Unit
1
2
3
4
0
1,050
2,100
Feet
0
1/4
1/2
Miles
Ontario, Canada
St. Clair River
Michigan
Blue Water Bridge
402
Black River
City of Port Huron
Port Huron Township
Port Huron Township
City of Port Huron
Stokes Creek
94
69
25

Figure 3.8.1

- Background zone – extends from the middle ground zone to as far as anyone can see.

Each VAU's visual quality is based on a rating from 1–7. On this scale, 1 = very low, 4 = average/moderate, and 7 = very high. **Tables 3.8.1 and 3.8.2** display the ratings assigned to the existing visual quality for each VAU for both viewers of and viewers from the highway.

Table 3.8.1 Visual Quality of Surrounding Environment (Viewers from the Highway)

Factor	Zone	VAU-1	VAU-2	VAU-3	VAU-4
Vividness	Foreground	2	2	5	5
	Midground	3	3	4	7
	Background	3	4	5	7
Intactness	Foreground	4	3	3	3
	Midground	5	2	3	4
	Background	5	3	2	4
Unity	Foreground	3	2	4	2
	Midground	4	2	3	3
	Background	4	4	3	3

Visual Quality Scale: 1= Very Low, 4= Average/Moderate, 7= Very High
Source: Wilbur Smith Associates

Table 3.8.2 Visual Quality of Plaza Study Corridor (Viewers of the Highway)

Factor	Zone	VAU-1	VAU-2	VAU-3	VAU-4
Vividness	Foreground	3	2	5	2
	Midground	3	2	4	2
	Background	3	2	4	3
Intactness	Foreground	4	1	2	1
	Midground	5	2	3	2
	Background	6	1	2	4
Unity	Foreground	4	2	4	1
	Midground	4	3	4	1
	Background	5	3	3	1

Visual Quality Scale: 1= Very Low, 4= Average/Moderate, 7= Very High
Source: Wilbur Smith Associates

A final visual quality rating for each VAU was determined by taking the sum of all of the ratings (foreground, midground, background) and averaging them. **Table 3.8.3** shows the final

Vividness: The relative strength of the seen image, the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive pattern.

Intactness: The integrity of visual order in the natural and human-built landscape, and the extent to which the landscape is free from visual encroachment.

Unity: The overall visual harmony of the composition and degree to which various elements combine in a coherent way.

ratings. These ratings are meant to provide a relative overall value of the visual quality of the existing landscape. All of the VAU units had an overall final rating of two to four. This indicates that the overall visual quality of the Study Area is low to average when compared to the visual resources that might be found elsewhere such as on a nature preserve or State or National Park. The highest overall visual ratings are for the area surrounding the potential off-site plaza area and at the Black River crossing.

Table 3.8.3 Visual Quality Rating for each VAU

Visual Assessment Units	Visual Quality Rating
VAU-1 – Port Huron Township	4
VAU-2 – Water Street/Lapeer Connector Area	2
VAU-3 – Black River Area	4
VAU-4 – Existing Plaza Area	3
A final visual quality ranking for each VAU was determined by averaging the sum of all three rankings.	

3.8.2 What are the Visual and Aesthetic Effects of a New Plaza on the Surrounding Area?

Assumptions and Methodologies: As noted previously in more detail, an initial assessment of existing visual quality was made by breaking the Study Area into four VAUs, and assigning rankings for the vividness, intactness, and unity of foreground, midground and background views. These rankings were made both for views from the road and plaza, and views of the road and plaza.

The exact appearance of each of the three Build Alternatives is only conceptual at this time. Since the ultimate appearance of the facility will have a dramatic effect on the visual quality of the area, the CSS workshops planned for the FEIS development process will involve public input to ensure that the visual elements of the new plaza and roadways will be as compatible as possible with the surroundings.

The assessment that follows looks primarily at the impact from a conceptual perspective. The specific effects of the project on visual resources will be better defined during the FEIS process.

No-Build Alternative: Under the No-Build Alternative, the existing plaza would remain as is and the visual landscape would not be changed from its current situation.

City East Alternative: This alternative would expand the existing plaza significantly and subsequently change the view surrounding the existing plaza location. The plaza would still be a dominant visual element for the surrounding residences, but in a somewhat different manner. Although it would no longer be entirely elevated, portions of the plaza would continue to remain slightly elevated and the mostly at-grade plaza would have a perimeter security fence up to eight feet tall encompassing the new facility. This fence would be approximately one mile in total length and would block some views of the plaza from the adjacent residences and businesses. The buildings located on the plaza would be similar in height to the current buildings on the plaza. However, their ground elevation would be at grade instead of 24 feet in the air, thus reducing some of the views from the surrounding neighborhoods and businesses.

Another visual change is that traffic would no longer travel under the plaza on Pine Grove Avenue. Pine Grove Avenue would be relocated to the east and traffic would go around the plaza. Thus the motoring public would no longer have the tunnel effect of the plaza on Pine Grove Avenue.

Traffic would no longer travel under the plaza for the City East Alternative

For drivers coming into or leaving the country, the view from the highway and plaza facility would be less striking visually if the plaza were reconstructed at street level. The Blue Water Bridge and the surrounding area would be less visible to drivers from the plaza. The view drivers would see of the plaza would not change much as the driver would still be viewing the elements of a border crossing, although a newer one.

Overall, the change in view for the City East Alternative would be most evident for those residents or businesses that are adjacent to the new plaza (VAU-4) as the new plaza would

have a security perimeter that would obstruct some of the view of the new plaza and would likely be an improvement from the current view of the elevated plaza.

Examples of barrier walls

City West (Preferred) Alternative: Similar to the City East Alternative, the City West Alternative would expand the existing plaza significantly and subsequently change the view surrounding the existing plaza location. As described earlier the City East Alternative would relocate Pine Grove Avenue to the east and traffic would go around the plaza. Whereas, Preferred Alternative will relocate Pine Grove Avenue to the west. For both alternatives, the motoring public would no longer have the tunnel effect of the plaza over Pine Grove Avenue.

Overall, the change in view for the Preferred Alternative would be most evident for those residents or businesses that are adjacent to the new plaza (VAU-4) as security perimeter of the new plaza would obstruct some of the view of the plaza and would likely be an improvement from the current view of the elevated plaza.

Township Alternative: This alternative would impose visual impacts on the entire Study Area through a new plaza location and the potential 20-foot high security barriers that would secure the 1.5 mile interstate corridor between the Blue Water Bridge structures and the new plaza. For travelers making an international border crossing, this section will provide them with a "tunnel vision" restricted view with 20-foot high vertical barriers to each side of the roadway. Depending upon the movement of the sun across the sky at different times of the day and the year, the secure corridor would likely be in shadow a good portion of the day. It is likely that this portion of roadway would be heavily lit at night, not only for security reasons, but also because much of the ambient nighttime light would also be shaded in a similar fashion.

The Township Alternative would impact VAU-1 the most. The new plaza would significantly alter the existing landscape in the township area and change the associated views. The new plaza would be located in an area that is zoned residential and currently consists of old field and open space. The view from the interstate also includes residences and a large church. The addition of the plaza, security fencing and associated

lighting would change the visual quality of VAU-1. This would limit the views of those who currently look out over this land. The interstate footprint would be expanded elsewhere in VAU-1, eliminating some of the wooded areas.

The new relocated plaza in the Township Alternative would introduce a large border crossing facility to an area currently occupied by open space. Nearby residents and church patrons will experience a change in the visual appearance of the site, from open fields to the border crossing facility. While most of the new plaza facility will be at-grade, the facility will necessitate new elevated ramps on fill or structure to accommodate movements into and out of the plaza and a perimeter security wall or fence that will be up to eight-feet high. These ramps will be a prominent addition to the landscape as well. Residents located north of the existing freeway currently have a view of the I-94/I-69 freeway in the distance. The new view will be of a perimeter security wall or fence and the plaza buildings. Much of the plaza should be shielded by the perimeter security feature.

The addition of the security walls for the I-94/I-69 corridor would probably have the least amount of impact for viewers from I-94/I-69 in VAU-2 because the visual quality of the area is already quite low. Viewers of the interstate would see a reduction in visual quality. The public campground and park that sit north of the corridor near Water Street would have views of the security barriers for the corridor where vegetation does not currently block the view of the freeway and traffic. The new view would include the 20-foot high security barriers, although these barriers would hide much of the traffic.

The view shed through the Black River area (VAU-3) would also be changed as a result of Township Alternative. The security barriers would likely eliminate any views of the Black River for those motorists traveling along I-94/I-69. Viewers of the interstate would also have their views diminished by the presence of the security barriers. The nearby marinas and parks would be affected the most from this change in view. The barriers would reduce the vividness of the view and would also lower the intactness and unity of the view.

The view of the Black River Bridge would change for The Township Alternative

The existing viewsheds and visual quality rating in VAU-4 would remain relatively unchanged. The existing plaza area would continue to remain elevated and contain a duty free shop. Some residents in the western end of this VAU would have a change in their view. With the new security barriers in place and a new ramp to Pine Grove Avenue, these residents would no longer have the view of the interstate that they once possessed.

3.8.3 What are Potential Light Pollution Effects?

What is a Light Pollution?

The International Dark-Sky Association describes light pollution as, "Any adverse effect of man-made light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste."

The effects of artificial lighting provided for nighttime activities at the plaza facility and project roadways are a notable concern raised by stakeholders on this project. The provision of artificial lighting needs to balance the security needed for visual recognition of persons, goods and vehicles in the plaza with the environmental and quality-of-life impacts that come from the lighting at night.

Artificial lighting can have a number of effects on the surrounding area. While fixtures are generally designed to focus and direct light downward to cover only the areas that need illumination, light often gets directed laterally or upwards (either intentionally or unintentionally), contributing to "light pollution" that is often observed in densely settled areas. The effects of light pollution are already present at the existing plaza, and increasing the footprint of the plaza and associated roadways would increase the areas affected by light pollution in the Study Area unless mitigation measures are implemented. Light pollution may:

- Affect the natural responses of plants and animals to light. Light pollution can disrupt feeding, migration, or defense behaviors of birds, mammals, fish, invertebrates, reptiles and amphibians
- Disturb sleep patterns in humans, thereby influencing quality of life. Some researchers believe that light pollution also may have other health effects
- Interfere with the observation of the nighttime sky. Stars, planets, and other elements of the night sky are less visible in areas where artificial lighting is directed skyward

To roughly estimate the likely provision of light in the Study Area, two sources were consulted; the "United States Land

Port of Entry Design Guide, April 22, 2005" ((from General Services Administration (GSA) and other federal agencies)) and GSA document P100, "Facilities Standards for the Public Buildings Service". Design of lighting at the plaza and associated roadways will have to meet numerous requirements. At the federal level alone, the port of entry design guide notes:

- High contrast between dark areas and the bright booth area is a problem for inspectors, so approaches to Primary Inspection must be brightly lit. To minimize glare for inspectors, lighting must have low cut-off angles. As light level requirements vary from location to location in the facility, the transition should be gradual and not abrupt.
- Spot illumination of license plates is needed for the visual or surveillance camera documentation. Lighting is also needed to improve recognition of items or people within vehicles. Lighting needs to be "true color" for vehicle and passenger identification purposes.
- In many cases, light must come from two or more directions to avoid shadows. Day lighting is also to be used as needed.

The GSA guide notes:

- Placement of lights should consider glare and contrast to allow for better night vision. Illumination must not allow light to "trespass" off of the building property. GSA recommends a minimum 80-degree cutoff of light fixtures to achieve this.
- Lighting levels need to consider surveillance technology, to avoid areas that are too bright or are in shadows. Lower levels of light in specific locations may be desirable for safety reasons or to accommodate certain types of camera technology.

Port Huron Township has its own light guidelines as part of its zoning ordinance:

- Any operation or activity which produces glare shall be conducted so that direct and indirect illumination from the source of light does not exceed one-half (1/2) of one (1) footcandle when measured at any point along the property line of the site on which the operation is located.

Given these considerations, the following effects of light pollution are expected:

No-Build Alternative: This alternative would be expected to keep the facility in its existing configuration and lighting design. While the No-Build Alternative already produces substantial illumination in the Study Area, it is presumed that the lighting would remain as it is today, with no new areas of effect or changes in the brightness or desired/undesired light levels that currently impact the Study Area. The portions of the Study Area primarily impacted by the No-Build Alternative would be VAU-4.

City East Alternative: This alternative will keep the reconstructed plaza in the same general location as it exists today. There would be mixed effects of this alternative on undesired light pollution. By lowering the height of portions of the plaza, there might be reduced levels of light overspilling the margins of the facility in selected locations.

Artificial Lighting Example

The City East Alternative will have a substantial impact on adjoining properties throughout the Study Area, as discussed in greater detail in **Section 3.6 Relocations**. In VAU-1, relocations of residential properties would remove some existing light sources/affected properties while the new roadways and other plaza improvements would introduce some new sources of light in the same general area. Similarly, relocations of businesses such as those found on Pine Grove Avenue and Hancock Street would reduce the levels of light pollution in that area if those areas are converted to green space. New plaza facilities and roadways would re-introduce light in new directions and new locations.

One benefit from the relocations associated with this Alternative is that there would generally be a greater buffer distance between the most intensely-lighted parts of the plaza and nearby residential properties, particularly the properties south and east of the existing plaza/interstate. Widening of the interstate may bring the lighting of the roadways closer to some properties in VAU-1, VAU-2, and VAU-3.

City West (Preferred) Alternative: Similar to the City East Alternative, there would be mixed effects of the City West Alternative on undesired light pollution.

The Preferred Alternative will have a substantial impact on adjoining properties throughout the Study Area, as discussed in greater detail in **Section 3.6 Relocations**. Relocations of businesses such as those found on Pine Grove Avenue, Hancock Street would reduce the levels of light pollution in that area if those areas are converted to green space.

Similar to the City East Alternative, one benefit from the relocations associated with Preferred Alternative is that there would be a greater buffer distance between the most intensely-lighted parts of the plaza and nearby residential properties.

Township Alternative: In general, the Township Alternative will introduce more new light pollution than the other Build Alternatives, and the pollution would be more widespread. In VAU-4, the existing plaza site would continue to be elevated and used for maintenance facilities and the duty-free shop, though these facilities may have lower requirements for illumination than the security plaza-oriented facilities which would be moved to the new plaza site.

For VAU-2 and VAU-3 the widening of the interstate would bring light sources closer to adjoining areas. In addition, the level of illumination on the roadways themselves would likely increase due to security requirements.

The most prominent light pollution impacts from the Township Alternative would be the lighting for the new plaza in VAU-1. This area is currently much less densely developed than the other VAUs, and therefore, there are fewer existing sources of ambient light. The removal of the open space in the new site location will introduce a new source of light pollution to properties both north and south of the existing interstate highway.

3.9 Air Quality

The U.S. Environmental Protection Agency (EPA) has jurisdiction over pollutants that are regulated under the Federal Clean Air Act (CAA) of 1970 and its amendments. Two sets of pollutants are of concern with regards to this project: Criteria pollutants regulated under the National Ambient Air Quality Standards (NAAQS) and Mobile Source Air Toxics (MSAT).

National Ambient Air Quality Standards (NAAQS)

The NAAQS were formulated to protect public health, safety, and welfare from known or anticipated air pollutants. The most recent amendments to the Clean Air Act contain criteria for sulfur dioxide (SO_2), particulate matter (PM_{10}, ten-micron and smaller and $PM_{2.5}$ 2.5 micron, and smaller) carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). The specific NAAQS are presented in **Table 3.9.1**.

Locations that do not meet these standards are designated by the EPA as "nonattainment" areas for each pollutant that does not meet the standards. Amendments to the Clean Air Act have established time schedules for the states to reduce pollutant levels to comply with the NAAQS in nonattainment areas.

Sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) are important mobile source pollutants; sulfur dioxide (SO_2) particularly in regard to diesel engines. For transportation projects, particular attention is focused on ground-level ozone (O_3), carbon monoxide (CO) and particulate matter (PM).

Ozone (O_3): In the upper atmosphere, O_3 protects us from ultraviolet radiation (the "ozone layer"). However, near the ground, ozone is a pollutant of particular concern to people with lung and respiratory problems such as asthma. O_3 is not created directly by cars and trucks, but rather is created by chemical reactions in the atmosphere involving sunlight and precursors such as volatile organic compounds (VOC) and oxides of nitrogen (NO_x). These precursors are emitted by motor vehicles and industrial sources. Ozone precursors can be transported by wind for long distances from where they are

What Measuring Units are Used for Air Quality Measurements?

When chemical compounds are in tiny concentrations, they are often represented with one of the following:

Parts Per Million (ppm): This is a ratio of the number of molecules of a pollutant compared to a million molecules of air. So 3 ppm concentration of CO means 3 CO molecules per million air molecules.

Parts Per Billion (ppb): This is a ratio of the number of molecules of a pollutant compared to a billion molecules of air.

Micrograms (µg): A microgram is a millionth of a gram. $\mu g/m^3$ is shorthand for micrograms per cubic meter. (Similarly, mg/m^3 is milligrams per cubic meter; one thousandth of a gram).

Microns: are millionths of a meter. The classes of particulate pollution of concern are particulate matter smaller than ten microns in size (PM_{10}) and particulates smaller than 2.5 microns in size ($PM_{2.5}$).

initially emitted and for this reason, ozone is more of a regional concern than a localized issue.

EPA's eight-hour ozone standard of 0.08 parts per million (ppm) is designed to protect against longer ozone exposure periods. The one-hour primary standard was revoked by the EPA June 15, 2005.

Table 3.9.1 National Ambient Air Quality Standards (NAAQS) as of June, 2007

Pollutant	Averaging Time	Primary Standard[1]	Secondary Standard[2]
Sulfur Dioxides (SO_2)	Annual (Arithmetic Mean)	0.03 ppm (80 μg/m^3)	
	24 – Hour	0.14 ppm (365 μg/m^3)*	
	3 – Hour		0.5 ppm (1300 μg/m^3)*
Particulate Matter ($PM_{2.5}$)	Annual (Arithmetic Mean)	15 μg/m^3	Same as Primary
	24 – Hour	35 μg/m^3	No Secondary Standard
Particulate Matter (PM_{10})	24 – Hour	150 μg/m^3*	No Secondary Standard
Carbon Monoxide (CO)	8 – Hour	9 ppm (10 mg/m^3)*	No Secondary Standard
	1 – Hour	35 ppm (40 mg/m^3)*	No Secondary Standard
Ozone (O_3)	8 – Hour[3]	0.08 ppm (157 μg/m^3)	Same as Primary
Nitrogen Dioxide (NO_2)	Annual (Arithmetic Mean)	0.053 ppm (100μg/m^3)	Same as Primary
Lead (Pb)	Calendar Quarter (Arithmetic Mean)	1.5 μg/m^3	Same as Primary

1) "Primary air standard" means the level of air quality, which provides protection for public health with an adequate margin of safety.
2) "Secondary air standard" means the level of air quality, which may be necessary to protect welfare from unknown or anticipated adverse effects.
3) The 8-hour primary and secondary standards are met when the 3-year average of the 4th highest average concentration is less than or equal to 0.08 ppm.

* Concentration not to be exceeded more than once per year

Source: US EPA web site on NAAQS at http://www.epa.gov/air/criteria.html, accessed 6/7/07.

Carbon monoxide (CO): CO is a colorless and odorless gas which is the product of incomplete combustion, and is the major pollutant from gasoline-fueled motor vehicles. CO is harmful because it reduces oxygen delivery to the body's organs and tissues. It is most harmful to those who suffer from heart and respiratory disease. CO emissions are greatest from vehicles operating at low speeds and prior to complete engine

warm-up (within approximately eight minutes of starting), particularly in colder winter months. Congested urban intersections tend to be the principal problem areas for CO.

Particulate Matter (PM): Particulate matter (PM) is the term for solid or liquid particles suspended in the air. Some particles are large or dark enough to be seen as soot or smoke, but fine particulate matter is generally not visible to the naked eye. Two types of PM are of concern. PM_{10} (ten microns or smaller) particulates are coarse particles, such as windblown dust from fields and unpaved roads. $PM_{2.5}$ (2.5 microns or smaller) covers finer particulates smaller than 2.5 microns in size. $PM_{2.5}$ particulates are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. $PM_{2.5}$ is a health concern because fine particles can reach the deepest regions of the lungs. Health effects include asthma, difficult or painful breathing, and chronic bronchitis, especially in children and the elderly. Fine particulate matter associated with diesel exhaust is also thought to cause lung cancer.

In recent years, the EPA has modified the NAAQS for $PM_{2.5}$ Currently, the standard is 15 micrograms per cubic meter ($\mu g/m^3$) (annual arithmetic mean) and the 24-hour standard is 35 $\mu g/m^3$. EPA revoked the annual standard for PM_{10} in December 2006; there is still a 24-hour standard of 150 $\mu g/m^3$.

Since an important component of the Blue Water Bridge Plaza project will be serving heavy-duty vehicles, diesel exhaust is a particular concern. Diesel exhaust is a complex mixture of inorganic and organic (carbon-based) compounds that occur as a blend of gases and particles. The particle phase of diesel exhaust consists of elemental carbon, adsorbed organic compounds and small amounts of sulfate, nitrate, metals and other trace elements. Diesel particulate matter has been estimated to comprise about six percent of the total $PM_{2.5}$ inventory nationwide but more in urban areas, excluding natural and miscellaneous sources (EPA, 2002).

Mobile Source Air Toxics (MSAT)

In addition to the pollutants regulated under the NAAQS, EPA also regulates air toxics, also called "hazardous air

What are Other Vehicular Air Pollutants Covered by the NAAQS not Discussed at Length?

Lead: Lead (Pb), a toxin, has steadily declined since the 1970s with introduction of unleaded fuels.

VOCs: Volatile Organic Compounds (VOCs) come from vehicles and industrial sources. The term VOCs encompasses thousands of compounds, including petroleum constituents as well as industrial thinners, solvents, etc. VOCs are of interest primarily from their role in ozone formation, a regional pollutant and as a precursor of $PM_{2.5}$.

NO_X: The term "Oxides of Nitrogen" (NO_x) covers a number of chemical compounds containing both nitrogen and oxygen. Like VOCs, NO_x also are ozone and $PM_{2.5}$ precursors and generated by motor vehicles. NO_2 (nitrogen dioxide) is a specific type of NO_x (see **Table 3.9.1**). NO (nitric oxide) is also an irritant and ozone precursor, which reacts with oxygen to form NO_2.

(SO_2): The main product from the combustion of sulfur compounds and is often described as the "smell of burning sulfur". SO_2 is produced by volcanoes and in various industrial processes. Since coal and petroleum contain various amounts of sulfur compounds, their combustion generates sulfur dioxide.

pollutants." Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). EPA has identified 188 air toxics of concern, of which 21 come from mobile sources. Six of these 21 have been identified as "priority MSATs." Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

FHWA's I*nterim Guidance on Air Toxic Analysis in NEPA Documents* (February 3, 2006) was applied to this project. Early in 2007, EPA signed a final rule, "Control of Hazardous Air Pollutants from Mobile Sources", which sets standards to control MSATs. Under this rule, EPA is setting standards on fuel composition and vehicle exhaust emissions to be phased in through 2015.

MSATs are projected to decline dramatically over the next two decades as regulations for fuels and motor vehicle technology create reductions in the emissions of these pollutants.

Which Air Toxics are of Most Concern?

Six air toxics have been called out as "priority toxins":

Benzene is a known human carcinogen.

Acrolein's carcinogenicity has not been determined based on inadequate data on oral inhalation exposure.

Formaldehyde is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.

1,3-butadiene is carcinogenic to humans by inhalation.

Acetaldehyde is a probable human carcinogen based on tumors in lab rats and hamsters after inhalation exposure.

Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation. DE is the combination of diesel particulate matter and diesel exhaust organic gases. DE is also likely associated with chronic respiratory and pulmonary problems.

3.9.1 What is the Current Status of Air Quality?

The Clean Air Act requires each state to have a State Implementation Plan (SIP) to demonstrate how it will attain and/or maintain federal air quality standards.

The Blue Water Bridge Plaza project is located within the Metropolitan Detroit-Port Huron Intrastate Air Quality Control Region (AQCR #123). St. Clair County is currently in attainment status for five of the seven criteria NAAQS pollutants, and has been classified as being in non-attainment for $PM_{2.5}$ and the eight-hour ozone standard.

The Michigan Department of Environmental Quality (MDEQ) reported in the most recent annual report, "Michigan's 2005 Annual Air Quality Report", published in August 2006, that the entire state has continued to stay in attainment for CO, lead, NO_2 and SO_2 with "levels well below the NAAQS." The

main contributing factors to Michigan's O_3 and $PM_{2.5}$ non-attainment areas are "on-road and non-road emission sources (O_3: 33 percent and 30 percent, respectively; $PM_{2.5}$: 18 percent and 32 percent, respectively). In addition, area sources also contribute 37 percent of $PM_{2.5}$ emissions. Therefore, with the new federal Clean Air Rules, along with Michigan's continued reduction efforts, both of these criteria pollutants levels should continue to decline."

The Annual Air Quality Report also presents the following information:

- CO levels are estimated to be 20 percent less than the emission levels in 1990, which is slightly better than national trends. Motor vehicles on Michigan roads contribute approximately 69 percent of CO emissions.

- Lead emissions have decreased significantly over the last 25 years with the elimination of leaded gasoline. With no major point sources in Michigan, ambient lead concentrations are less than one tenth of the NAAQS.

- NO_2 levels in Michigan have always been less than half the NO_2 NAAQS. Motor vehicles on Michigan roads contribute approximately 46 percent of NO_2 emissions.

- O_3 levels across the country have improved over the last 20 years. Year by year variations in O_3 are influenced by weather, population growth and emissions of VOCs and NOx, the precursors to O_3 production. VOC and NOx emissions have decreased 25 percent and 12 percent nationwide over the past ten years. Michigan's O_3 levels have followed national trends. Using the three year average period of 2001-2003, only four locations in Michigan met the eight-hour NAAQS. The three-year period from 2003-2005 resulted in 24 of the 27 monitoring sites having O_3 levels meeting or below the eight-hour O_3 NAAQS. Motor vehicles on Michigan roads contribute approximately 33 percent of VOC emissions.

- PM_{10} emissions on a nationwide base are primarily produced by area sources, agricultural and forestry activities, paved and unpaved roads. Motor vehicles on

What is Conformity Analysis?

Transportation Conformity Analysis consists of two parts for conformity to NAAQS: Mesoscale (regional) and Microscale (localized). The Blue Water Bridge Plaza improvements have been included as part of the short-term and long-term plans for regional transportation improvements, thus Mesoscale. If MDOT wishes to receive partial federal funding for transportation projects, the plans must consider the air quality of the region and legally mandated requirements to work towards "conformity" with the NAAQS. Therefore, the effects of this project on regional air quality have already been accounted for, along with all the other mobile and non-mobile sources of air pollution in the region.

Michigan roads contribute approximately 14 percent of PM_{10} emissions.

- $PM_{2.5}$ source emissions decreased 17 percent between 1993 and 2002 across the country. In Michigan the primary source of $PM_{2.5}$ emissions are area sources, followed closely by the contribution of internal combustion engines, non-road and highway. The July 7, 2005 signing of the Clean Air Non-road Diesel Rule has the potential to reduce exhaust emissions of $PM_{2.5}$ from non-road diesel engines by more than 90 percent. Motor vehicles on Michigan roads contribute approximately 18 percent of $PM_{2.5}$ emissions.

- SO_2 levels in Michigan have been well below the NAAQS since achieving attainment status in 1982. Motor vehicles on Michigan roads contribute approximately three percent of SO_2 emissions.

- Air toxics have primarily been an issue in larger cities such as Detroit, where there are numerous sources; smaller cities and rural areas are not as much of a concern. MDEQ has not maintained a non-industrial monitoring station in St. Clair County since 1991.

3.9.2 What Impacts from Carbon Monoxide are Anticipated with the Project's Alternatives?

What is Microscale Analysis?

Microscale Analysis is part of Transportation Conformity Analysis. Also known as "hot-spot" analysis, it is the localized conformity to NAAQS.

Microscale carbon monoxide (CO) analyses for different years were performed to determine if the project would exceed the NAAQS.

The M-25/Hancock Street intersection was selected as the worst-case location for the microscale CO modeling because of the potential for backups at the signalized intersection for the three build alternatives (City East, City West, and Township Alternatives). Fifteen air quality receptors, A1 through A15, were placed along all four approach queues of the M-25/Hancock Street intersection and at two nearby residences and one commercial building for the City East and City West Alternatives. Six more receptors were added to account for the one-way pair proposed with the Township Alternative. Receptors were placed parallel to the roadways. The receptors along Hancock Street were located on existing and proposed

sidewalks. The receptors along M-25 were located at the right-of-way. The first receptor in each quadrant was located ten-feet from the intersection of the crosswalk with the curb or ten-feet from the extended right-of-way to the curb. The remaining two receptors in each quadrant were located at 82-foot intervals from the first receptor or if a cross street intervened, equidistant between the cross streets. The location of the air quality receptors were based upon the recommendations presented in EPA's CO Modeling Guidelines. The location of the air quality receptors are presented in **Figures 3.9.1, through 3.9.4.**

MOBILE6.2 and approved CAL3QHC models were used to analyze vehicular emissions and the hourly dispersion of CO at the receptors.

The results of the CO microscale air quality modeling are presented in **Table 3.9.2.** The maximum one-hour CO concentrations were 6.2 ppm for existing conditions (2005). The maximum No-Build concentrations decreased to 4.9 ppm in 2013 and 4.7 ppm in 2030. The City East Alternative would create 1-hour CO concentrations ranging from 3.8 to 4.7 ppm in 2013 and 3.9 to 5.1 ppm in 2030. CO concentrations for the City West Alternative would range from 4.0 ppm to 5.1 ppm in 2013 and from 4.0 to 4.9 ppm in 2030. The Township Alternative would create one-hour concentrations ranging from 3.9 to 5.1 ppm in 2013 and from 4.0 to 5.2 ppm in 2030. None of these concentrations exceed either the one-hour (35 ppm) or eight-hour (9 ppm) NAAQS. All concentrations include a background concentration of 3.4 ppm. Since the one-hour analysis predicted CO concentrations which are less than 9.0 ppm, a separate eight-hour analysis was not necessary.

As the calculated concentrations are within the NAAQS, no violations of the standards are anticipated.

How Do the Air Quality Models Work?

Calculations of existing and future concentrations of CO were modeled using two computer programs.

MOBILE6.2: calculates the rates of CO emissions (in grams per mile and grams per hour) of different vehicles in the present and future. These emission rates are influenced by the year (since emission-control technology improves each year), local fuel types (which vary by region), inspection / maintenance programs, composition of the local vehicle fleet by age, and other influences that vary by region.

CAL3QHC: calculates the concentration of CO (in ppm) at a given location (receptor). Starting with the emission rates from MOBILE 6.2, the calculations take into account the dispersion of emissions between vehicle tail-pipes and receptors. This dispersion is influenced by the location of roadways relative to the receptors, traffic volumes, how much idling occurs at traffic signals, the direction of winds and other meteorological factors.

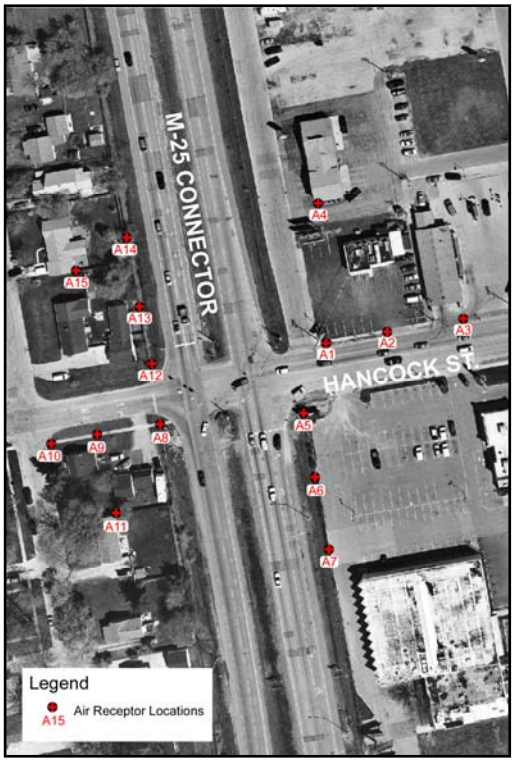


Figure 3.9.1 Air Quality Receptors for Carbon Monoxide Modeling for the No-Build Alternative

Figure 3.9.2 Air Quality Receptors for Carbon Monoxide Modeling for City East Alternative

Figure 3.9.3 Air Quality Receptors for Carbon Monoxide Modeling for the Township Alternative

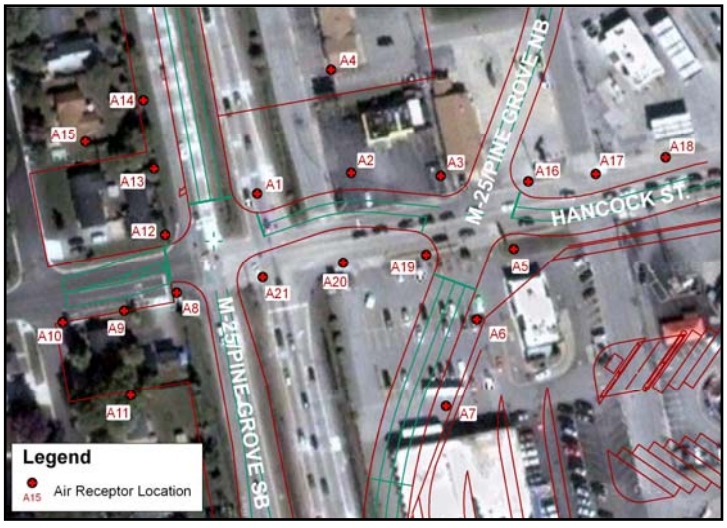


Figure 3.9.4 Air Quality Receptors for Carbon Monoxide Modeling for City West Alternative

Table 3.9.2 Maximum One-Hour CO Concentrations (ppm)*

Air Quality Receptor ID	Existing (2005)	2013				2030			
		City East	City West	Town-ship	No-Build	City East	City West	Town-ship	No-Build
A1	6.1	4.4	4.7	4.4	4.6	4.6	4.7	4.7	4.7
A2	6.1	4.7	5.0	4.3	4.8	5.0	4.8	4.1	4.7
A3	5.7	4.1	5.1	4.7	4.9	5.1	4.7	4.7	4.6
A4	4.8	3.8	4.0	3.9	3.9	3.9	4.0	4.0	4.0
A5	6.2	4.6	4.5	4.7	4.6	4.7	4.6	4.6	4.9
A6	5.8	4.5	4.5	5.0	4.5	4.4	4.5	4.8	4.7
A7	6.0	4.5	4.6	4.8	4.6	4.5	4.5	4.9	4.7
A8	5.6	4.6	4.9	4.4	4.7	4.7	4.9	4.8	4.6
A9	5.4	4.4	4.4	4.3	4.6	4.4	4.4	4.3	4.2
A10	4.9	4.1	4.4	4.1	4.4	4.4	4.3	4.1	4.0
A11	4.8	4.0	4.1	4.0	4.0	4.1	4.1	4.2	4.1
A12	5.7	4.4	5.0	4.6	4.6	4.5	4.7	5.0	4.6
A13	5.5	4.4	4.8	4.9	4.6	4.5	4.7	5.0	4.6
A14	5.9	4.3	4.7	4.8	4.5	4.5	4.7	5.0	4.6
A15	4.8	4.0	4.4	4.2	4.1	4.0	4.1	4.2	4.0
A16				5.1				4.6	
A17				4.9				4.4	
A18				4.6				4.1	
A19				5.1				5.2	
A20				4.5				4.5	
A21				4.5				4.9	

* The National Ambient Air Quality Standard for CO is 35 ppm for a one hour average.
Concentrations include an ambient background level of 3.7 ppm.

Shaded blocks indicate maximum concentration for each alternative and year of analysis.

3.9.3 What Impacts from Particulates are Anticipated with the Project's Alternatives?

The Blue Water Bridge is unique in that it has a customs plaza where trucks will idle as they queue for customs inspection

both primary and, potentially, secondary. Once a Recommended Alternative has been formally selected, plaza activity will be examined to determine whether a baseline of 100 tons a year is exceeded for $PM_{2.5}$.

Currently, there are no good models for the purposes of quantitatively predicting particulate concentrations from transportation projects. Therefore, EPA and FHWA issued joint guidance in March 2006 on how to perform qualitative hot-spot analyses in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas.

Prior to the preparation of the Final Environmental Impact Statement, this guidance will be applied to the Preferred Alternative to determine the likely qualitative effects of the project on $PM_{2.5}$ levels. This analysis will consider the following:

- existing air quality conditions
- sources of existing particulate matter in the area
- meteorological conditions
- existing and future traffic
- emissions from queuing at the inspection/toll booth areas
- projected trends in heavy diesel particulate emissions
- How the proposed project would change particulate emissions based on preliminary regional data

St. Clair County, Michigan is in attainment for PM_{10}. Therefore, a PM_{10} hotspot analysis is not required to demonstrate transportation conformity. The proposed action represents a series of projects spread over time – interchange ramps, plaza, and bridge; not all the booths will be developed initially. Therefore, the amount of exposed earth will be limited at any time during the construction process. MDOT's 2003 Standard Construction Specification Sections 107.15(A) and 107.19 will apply to control fugitive dust during construction and cleaning of haul roads.

3.9.4 What Impacts from Mobile Source Air Toxics (MSAT) are Anticipated with the Project's Alternatives?

MDOT and FHWA reviewed the proposed operational improvements of the plaza and determined that this project is considered to be a project with "low potential MSAT effects"

(Tier II analysis). This determination is based on the fact that both the U.S. inspection facility and the Canadian plaza improvements will reduce idling on the I-94/I-69 corridor and within the plaza, and most of the inspection areas are further from residences. Additionally, the overall change in elevation for the proposed primary inspection area is not significantly lower than the existing primary inspection area, traffic volumes associated with the No-Build and all three build alternatives are almost identical, and the maximum AADT on the I-94/I-69 corridor is well below 140,000 AADT. Finally, national MSAT emissions are projected to continue to decrease. Given all of these findings, a Tier III MSAT analysis was determined not to be warranted.

Technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable quantitative estimates of MSAT emissions at the project level. EPA has not developed specific MSAT standard for use in NEPA analysis. Therefore, FHWA guidance calls for a qualitative assessment of future MSAT emissions for each alternative.

The following paragraphs provide a summary of the Tier II analysis completed for this project in accordance with FHWA's MSAT guidelines.

- **Similar Build Alternatives:** The amount of MSATs emitted would be proportional to the traffic projected for each alternative, assuming that other variables such as fleet mix are the same for each alternative. The traffic projected for the City East Alternative is identical to the No-Build Alternative. The traffic projected for the City West and Township Alternatives are slightly higher than the No-Build Alternative. These changes are due to revised traffic patterns, not as a result of increased capacity. The resulting MSAT emissions along the corridor are going to be very similar with only a slight increase expected along the section from the Black River Bridge to the new Township Alternative Plaza. The potential emissions increase with any of the proposed alternatives is offset somewhat by lower MSAT emission rates. The overall change in MSAT emissions with the

What are FHWA's MSAT Analysis Guidelines?

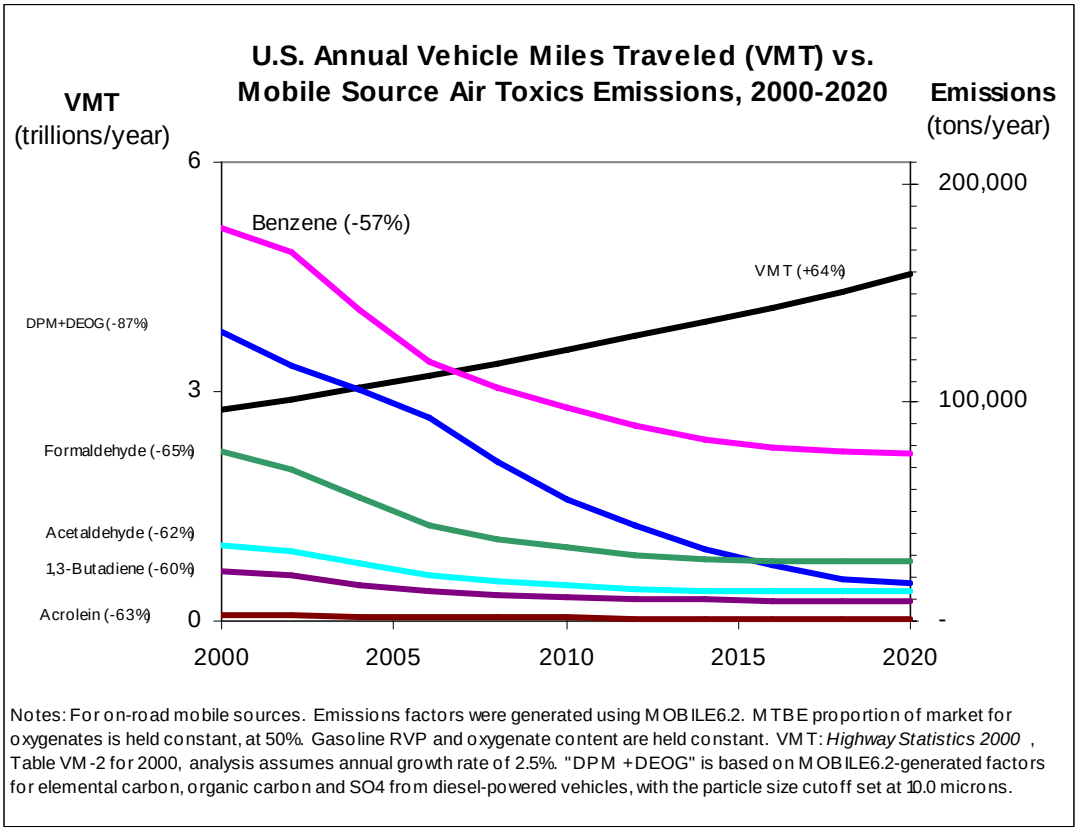
FHWA's Interim Guidance on Air Toxics Analysis for NEPA Documents, presents a tiered approach for analyzing Mobile Source Air Toxics (MSATs). Depending on project specifics, FHWA has identified three levels of analysis that can be completed for transportation projects. These analysis levels are:

- **Tier I:** No analysis is completed for projects with no potential for meaningful MSAT effects.
- **Tier II:** Qualitative analysis is completed for projects with low potential MSAT effects. These projects are typically those that serve to improve highway operations without adding substantial new capacity.
- **Tier III:** Quantitative analysis of emissions is completed to differentiate alternatives for projects with higher potential MSAT effects. These projects typically create new or add significant capacity to urban highways or interstates with traffic volumes are projected to be in the range of 140,000 to 150,000 vehicles a day or greater.

various alternatives cannot be reliably projected due to the inherent deficiencies of technical models.

Because the traffic projected for each alternative is nearly the same and the project will not create additional cross border traffic, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives.

- **National Emissions Trends:** Regardless of the alternative chosen, as illustrated in **Figure 3.9.5** emissions are projected to be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, traffic growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for traffic growth) that MSAT emissions in the Study Area are likely to be lower in the future in nearly all cases.



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: *Highway Statistics 2000*, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM+DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

Figure 3.9.5 National MSAT Emissions Trends

- **Vicinity to Adjacent Residences:** The additional travel lanes contemplated as part of all the alternatives from the Lapeer Connector east to the area of the existing plaza will have the effect of moving some traffic closer to nearby homes, and businesses; the Township Alternative will move the relocated plaza closer to a church and pre-school.

  The proposed improvements also change the relative distance from the major operations within both the City East and City West plaza alternatives to the nearest residences. Presently the nearest residences north of the Primary Inspection area are within 150-350 feet. South of plaza the residences are 400 to 500 feet away from the bridge toll booths and the Secondary Inspection. In the future the nearest residence will be approximately 400 feet from the Primary Inspection area with the remainder approximately 1,200 feet away. The bridge toll booth will be approximately 700 feet from the nearest residence, which is south of Scott Avenue. The nearest residences to the Secondary Inspection area will be along Hancock Street north of the plaza. These properties would be approximately 400 feet away. The GRIT facility is being relocated from the southwest corner of the plaza to the west edge along the M-25 Connector and Pine Grove Avenue. This facility will be approximately 50 feet closer to the nearest residence. As the GRIT process improves this procedure may eventually take place at the Primary Inspection area.

  Under each alternative there may be localized areas where ambient concentrations of MSATs could be higher under certain Build Alternatives than the No-Build Alternative. However, as discussed above, the magnitude and the duration of these potential increases compared to the No-Build Alternative cannot be accurately quantified due to the inherent deficiencies of current models.

- **Reduced Idling:** The proposed plaza improvements will reduce idling on the plaza in two primary areas on the plaza, the inspection booths used for primary inspection and in the vicinity of the Secondary Inspection. In the past, trucks were sent to the Secondary Inspection area for lack of proper paper work, or for additional inspection.

Recently procedures have changed and the paper work for a truck must be on hand before the truck arrives at the border. This procedure, which is already in place, reduces potential idling in the vicinity of the Secondary Inspection.

While trucks are in Secondary Inspection the inspectors require the drivers to turn off their vehicles. Trucks often idle when they are in a queue waiting to be processed through Gamma Ray Inspection Technology (GRIT) or Non-Intrusive Inspection (NII). The proposed improvements will provide three GRIT or NII lanes compared to today's two. Therefore, idling times would be expected to decrease by 33% compared to today's configuration. The final area where trucks idle is while they are in queue for Primary Inspection. The proposed plaza improvements will increase the number of truck Primary Inspection lanes from 10 to 20, with an option to expand to 30 in the future. This improvement should decrease the number of trucks idling in the queue by 50%.

- **Reduced Plaza Elevation:** The proposed plaza would also be lower than the existing plaza. The MDOT bridge toll booth would be at grade with outbound traffic climbing to the bridge. The Primary Inspection area however would be approximately eight feet lower than existing which would still be 16 feet above the nearest residences.

In sum, when a highway is widened and, as a result, moves closer to receptors, the localized level of MSAT emissions for the Build Alternatives could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

3.9.5 Is Any Mitigation of Air Quality Impacts Needed?

Based on the air quality analyses completed for the proposed improvements, this project will not contribute to any violation

of the NAAQS and is not expected to have a substantial effect on MSATs in the region. MDOT's 2003 Standard Construction Specification Sections 107.15(A) and 107.19 will apply to control fugitive dust during construction and cleaning of haul roads. No mitigation is proposed for reducing MSAT emissions; however MDOT and CBP will continue to utilize best management practices such as anti-idling procedures on the plaza particularly at toll booths, inspections stations and when backups occur due to incidents and heavy traffic. Additionally, MDOT will utilize Intelligent Traffic Systems, such as changeable message signs along the I-94/I-69 corridor to most effectively manage traffic operations and reduce long durations of idling where feasible.

3.10 Noise Impacts

3.10.1 Introduction to the Principles of Noise

Noise is defined as excessive or unwanted sound. Sound intensity is measured in decibels (dB), based on a logarithmic scale. The human ear does not respond identically to sound levels of different frequencies, being more sensitive to middle and high frequencies than low frequencies. When sound is described in terms of the frequencies humans are capable of hearing, the term 'dBA' is used. This refers to an 'A-weighted' scale, which does not consider those frequencies outside of the human hearing range. **Figure 3.10.1** shows examples of typical noise levels associated with transportation and other common activities in dBA.

What is meant by a Logarithmic Scale?

Since decibels are measured on a logarithmic scale, noise levels do not follow a linear progression. A doubling of noise energy creates an actual increase of about 3 dBA. For example, if one source of noise is at a 50 dBA level, a doubling of the noise intensity (two identical 50 dBA sources) would create a combined level of about 53 dBA, not 100 dBA. Four identical sources combined would produce 56 dBA.

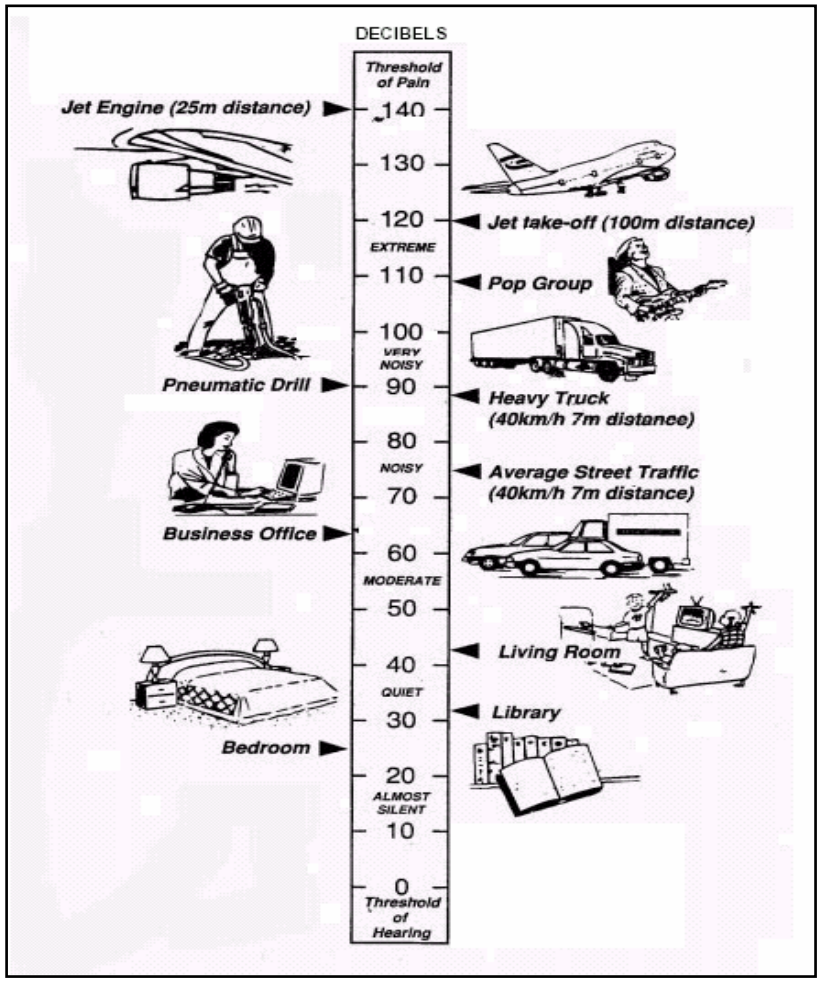


Figure 3.10.1
Illustrated Comparison of Noise Sources
Source: Real Traffic Noise Task Force Final Report, May 1999, Australian Environmental Protection Authority

Conversion of Metric Units to English Units

100 meters = 328 feet
25 meters = 82 feet
7 meters = 23 feet

40 kilometers/hour = 25 miles/hour

Several "rules of thumb" are helpful to keep in mind when considering noise impacts:

- The average human ear can barely perceive a 3 dBA change in noise level; a 5 dBA change is readily perceivable
- A 10 dBA increase is perceived as a "doubling" of noise, so a 60 dBA noise level is perceived as "twice as loud" as a 50 dBA noise level

Trucks on the Plaza

In an urban environment, noise is made up of two distinct parts. One is ambient or background noise. Wind noise and distant traffic noise make up the acoustical environment surrounding the project. These sounds are not readily recognized, but combine to produce a non-irritating ambient sound level. The other component of urban noise is intermittent and louder than the background noise. Local transportation and industrial noises are examples of this type of noise.

Noise levels from transportation facilities are influenced by several variables:

- Traffic volumes are a factor, though the effect is logarithmic. 2,000 vehicles per hour will be perceived as "twice as loud" as 200 vehicles per hour.
- Speed is a factor. Traffic traveling at 65 mph is perceived as "twice as loud" as the equivalent traffic traveling at 30 mph.
- Roadway vehicle noise comes from tires, engines, and exhaust.
- Engines typically will be louder when accelerating on a ramp or traveling uphill versus moving at a constant speed and/or traveling on a horizontal surface. Trucks downshifting down a downhill slope also increase engine noise.
- Heavy trucks create a disproportionate contribution to noise levels. The sound sources associated with trucks are noises from tires, engines, and exhaust.
- The worst-case noise levels will be achieved under a condition where traffic is moving the fastest while carrying the largest volume of vehicles (especially trucks). Therefore, on congested roadways, the peak traffic hour of the day may not be appropriate for a noise study because traffic would be moving very slowly from congestion.

Traffic noise is not constant. It varies over time as each vehicle passes a point. L_{eq}, or Equivalent Level, is the steady-state noise level during a given amount of time, L_{eq} represents the low and high noise levels averaged over a given time period (such as one hour) equated to a single continuous noise level. The term $L_{eq}(h)$ or "hourly L_{eq}") is used to describe the L_{eq} in an hour's time.

3.10.2 What are the Existing Noise Levels in the Study Area?

The FHWA has established Noise Abatement Criteria (NAC) to consider the noise impacts on certain land uses. These criteria are in the Code of Federal Regulations, Title 23 Part 772. MDOT has a Highway Traffic Noise Analysis and Commission Policy 10136, Noise Abatement, for implementing the NAC. The NAC for the various land uses are presented in **Table 3.10.1**.

Table 3.10.1 Noise Abatement Criteria, Hourly A-Weighted Sound Level in dBA

Activity Category	L_{eq} (1 Hr period)	Description of Activity Category / Land Uses
A	57 dBA (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the lands are to continue to serve their intended purpose.
B	67 dBA (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 dBA (Exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: Code of Federal Regulations, Title 23 Part 772, Revised April 2005

According to FHWA and MDOT policy, noise abatement measures will be considered when the predicted noise levels approach or exceed those values shown for the appropriate activity category in the table, or when the predicted traffic noise levels substantially exceed the existing noise levels. MDOT

defines "approach" as being within 1 dBA less than the noise levels shown in the table. MDOT has defined an increase over existing noise levels of 10 dBA or more as being "substantial."

Existing noise level measurements were conducted on July 28, 2004 at 14 representative sites in the Study Area: one park, one school, and 12 residences. The measurements were made in accordance with FHWA guidelines (23 CFR 772) using an integrating sound level analyzer. Traffic counts were taken at nine of the 14 sites concurrent with the noise measurements. The Study Team used FHWA Traffic Noise Model® (TNM) Version 2.5 to model the nine field measurements with concurrent counts to determine the applicability of the model to the specific project environment. The following parameters were used in this model to calculate the hourly L_{eq} at a specific receiver location:

Home near the Plaza

- Distance between roadway and receiver
- Relative elevations of roadway and receiver
- Hourly traffic volumes by vehicle type
- Vehicle speed
- Roadway grade
- Topographic features, including retaining walls and berms
- Noise source height of the vehicles

The model results were close enough to the measured noise levels to conclude that the noise model could be used for the project. All nine modeled sites compared within 0-3 dBA of the measured levels. This represents a reasonable correlation since the human ear can barely distinguish a 3 dBA change in the L_{eq} noise level in the urban environment. The site by site comparison is presented in **Table 3.10.2.**

Table 3.10.2 Comparison of Measured and Modeled Noise Levels

Field Site[1]	Noise Level, dBA L_{eq}		Difference in Noise Level, dBA L_{eq} (Modeled Minus Measured)
	Measured	Modeled	
152	66	69	3
132	69	67	-2
87	63	66	3
81	55	57	2
64	63	65	2
51	60	62	2
45	61	59	-2
7	53	56	3
26	66	66	0

[1]Sites 107, 70, 17, 22, and 42 were not modeled, no traffic counts were available.

3.10.3 How Will the Alternatives Affect Noise Levels?

After establishing existing noise levels, TNM 2.5 was used to model future peak hour traffic noise levels for each alternative, for the year 2030. The modeling effort considered 180 representative receiver locations (numbered 1 through 176, plus four additional receivers numbered 79A, 80A, 120A and 130A) as shown in **Figure E.24 of Appendix E**. These representative receivers were selected to model the noise impacts at two churches, three schools with playfields, two parks (including 50 RV spots in one of the parks), one hotel, 15 businesses, and 401 residences, which include apartments and trailer homes adjacent to the proposed project. The results of the computer modeling are presented in **Figure E.25 A to C of Appendix E**. and summarized below.

No-Build Alternative: Year 2030 No-Build traffic noise levels within the corridor would approach or exceed the NAC at 101 residences, six businesses including one hotel/motel, and at Township Park No. 1.

City East Alternative: Year 2030 design hour noise levels adjacent to the City East Alternative would approach or exceed the NAC at 74 residences and four businesses including one hotel/motel, and at one township park. None of the noise receivers would be exposed to noise levels that "substantially exceed existing" noise levels.

City West (Preferred) Alternative: The City West Alternative would cause 2030 design hour noise levels to approach or exceed the NAC at 48 residences and four businesses including one hotel/motel, and at one township park. None of the noise receivers would be exposed to noise levels that "substantially exceed existing" noise levels.

Township Alternative: Year 2030 design hour noise levels adjacent to the Township Alternative would approach or exceed the NAC at two businesses, 65 residences, and at 14 RV spots in Township Park No. 2. None of the noise receivers would be exposed to noise levels that "substantially exceed existing" noise levels.

What is the Parallel Barriers Effect?

When there are two walls that are parallel and close together, noise occurring in the corridor between the two walls can reflect off of one wall and carry over the top of the other wall. In this case, the noise barriers would be less effective in reducing the noise impacts on neighboring homes and businesses.

The security walls adjacent to I-94/I-69 for the secured corridor for the proposed Township Alternative could further increase the noise levels for Receivers 42 – 70 and 79 – 114 above those shown in **Figure E.24 of Appendix E**. This phenomenon would be caused by the "parallel barriers" effect. Because both sides of the secured I-94/I-69 would contain high walls, noises can reflect off the nearer wall and carry over the top of the other wall. The TNM 2.5 program provides a parallel barrier analysis tool.

A parallel barrier study was performed at three locations between the Black River and the relocated bridge plaza. Based on this analysis, the security fences could raise noise levels 3 to 8 dBA above the results shown in **Figure E.25 Sheets A to C of Appendix E**. The increases vary widely and are a function of the height of the security walls and the relative elevation

differences between the roadways and the receivers. The noise effects of the parallel barriers will be analyzed and noise abatement measures developed, based on the final specifications for the secured corridor, if the Township Alternative is selected as the Preferred Alternative.

3.10.4 How Will the Noise Levels that Exceed the NAC be Mitigated?

MDOT has criteria for determining where noise abatement should be provided. These criteria are summarized as follows:

- Noise abatement will be recommended if found "feasible" and "reasonable" for existing developments, and any future developments approved before the "date of public knowledge" only (in this case, issuance of a Record of Decision).

- Commercial and industrial sites generally prefer a full view to their establishments. Sites zoned commercial/industrial or expected to convert to those uses will be asked if they want noise abatement. If they do not want it, it will not be provided.

- Mitigation needs to be feasible from an engineering standpoint.

- A noise abatement measure is not feasible if it cannot achieve at least a 5 dBA noise reduction.

- Noise mitigation will be considered "reasonable" if the construction cost is less than $38,060 or less (in 2007 dollars) per benefiting dwelling unit.

- Local jurisdiction(s) may be required to enter into a maintenance agreement with MDOT regarding the noise barrier.

- A majority of the affected residents must be in favor of abatement.

- Where an extreme noise impact is identified (80 dBA Leq or greater), special consideration may be given on an

Noise Wall Example

individual basis.

Within the framework of MDOT's criteria, various methods could be considered:

- reduction of speed limits
- restriction of truck traffic to specific times of the day,
- a total prohibition of trucks,
- alteration of horizontal and vertical alignments,
- property acquisition for construction of noise barriers or berms,
- acquisition of property to create buffer zones to prevent development that could be adversely impacted,
- noise insulation of public or nonprofit institutional structures and in certain circumstances, residential structures,
- use of berms,
- and the use of sound barriers

What is a "Berm"?

A noise berm (pictured above), also called an earth berm, is a mound of dirt that appears natural and blends smoothly with adjacent topography for an attractive appearance. It can be an effective way of mitigating traffic noise if it can block the line of sight between the traffic and nearby homes. However, an earth berm can require a lot of land if it is very high, so it may encroach into adjacent properties as well as require a lot of highway right of way. Noise walls are sometimes placed on top of berms to get more benefit. (Photograph courtesy of FHWA).

Reductions of speed limits, although acoustically beneficial, are seldom practical unless the design speed of the proposed roadway is also reduced. Restriction or prohibition of trucks is counter to the project's purpose and need. Design criteria and recommended termini for the proposed project preclude substantial horizontal and vertical alignment shifts that would produce noticeable changes in the projected acoustical environment. The construction of noise berms is neither feasible nor reasonable because of the amount of space that would be required. Therefore, only the construction of noise barriers was reviewed. The berm shown for the Township Alternative around the proposed plaza is intended as a visual screen.

Under the Township Alternative, mitigation of the reflected noise in the area of the security fences could be accomplished with absorptive facings on the roadway side of the security fences. Depending on the absorption coefficient of the materials and the area covered it is possible that the noise increases created by the parallel barriers could be reduced from a range of 3 to 8 decibels to a range of 1 to 3 decibels.

3.10.5 Where were Noise Barriers Considered?

Representative Michigan Noise Wall

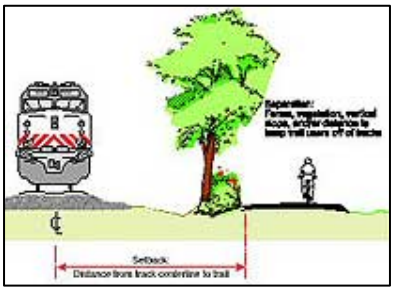
Noise barriers were analyzed at six locations within the project limits. Two of the noise barrier locations were analyzed for the City East Alternative, one was evaluated for the City West Alternative and three were analyzed for the Township Alternative. Noise barriers were modeled for the City East, City West and Township Alternatives west of the M-25 Connector between Hancock Street and the Black River. Noise barriers were also modeled for the City East and Township Alternatives west of the M-25 Connector between Garfield Street and Hancock Street.

The sixth noise barrier location was modeled for the Township Alternative and was located west of I-94/I-69 and north of Lapeer Street. No noise barrier was modeled in this area for the City East and City West Alternatives since the location of I-94/I-69 in this area is not being changed and no additional capacity is being provided.

The results of the barrier analysis, including barrier location, future hourly Leq noise levels without and with a barrier, barrier length and height, estimated cost, the number of residential units benefited, the noise reduction provided by the barrier and the cost per residential unit are presented in **Table 3.10.3**. All of the noise barriers analyzed meet MDOT's feasibility criteria. However, only five noise barriers (Noise Barriers 1, 2, 4, 5, and 6) meet MDOT's definition for "reasonableness" described above.

There are other areas along the I-94/I-69 Corridor where individual receptors exceed the NAC, such as Receivers 1, 3 and 4 which extend along the right-of-way for approximately 1,400 feet. However, it is impossible to design a barrier for single receptors that would meet MDOT's cost criterion of $38,060. There are additional locations along the improved local streets in Port Huron where receptors exceed the NAC. In these areas, local cross streets and driveway access prohibit the construction of feasible noise barriers.

3.10.6 Are There Considerations for Preventing Future Development from Being Adversely Affected by Noise?



Example of a setback.

As part of the noise modeling effort, a "setback" distance was calculated for protecting properties from noise on major roadways. The setback distance for residential properties impacted by a 66 dBA Leq hourly noise level along the I-94/I-69/M-25 corridor was calculated as 380 feet for the City East and City West Alternatives and 340 feet for the Township Alternative. Noise levels within these distances, measured perpendicular to the centerline of the nearest lane of the roadway, was modeled to be 66 dBA or greater. This setback distance was developed to assist local planning authorities in developing land use control over the remaining undeveloped lands along the project in order to prevent further development of properties that would experience excessive noise levels.

3.10.7 What will the Effects from Construction Noise be and How would they be Mitigated?

The major construction elements of this project are expected to be demolition, hauling, grading, paving, and bridge construction. General construction noise impacts for passersby and those individuals living or working near the project can be expected particularly from demolition, earth moving and paving operations. Considering the relatively short-term nature of construction noise, and the fact that construction will only take place from dawn to dusk, impacts are not expected to be substantial. The ability of buildings to reduce indoor noise levels to acceptable levels is believed to be sufficient to moderate the effects of intrusive construction noise.

3.10.8 What are the Next Steps in Addressing Noise Impacts?

Based on the study completed and as shown in **Table 3.10.3**, **Appendix E and figure E.24** MDOT recommends the installation of the noise barriers for the City East and Township Alternatives. The noise barriers proposed west of the M-25 Connector, between Garfield Street and Hancock

Street and between Hancock Street and the Black River, are feasible and reasonable for the City East or the Township Alternatives, while the noise barrier west of I-94/I-69 and north of Lapeer Street is feasible and reasonable only for the Township Alternative. If final design results in substantial changes in roadway design from modeled conditions, noise abatement measures will be reviewed.

During the public comment period on the DEIS, comments on noise concerns will be solicited at public meetings from local residents, and officials of the jurisdiction(s) affected by the project. These comments will be considered in the noise analysis in the Final EIS. During the design phase the feasibility and reasonableness of the noise barriers are reviewed in greater detail and may be altered or eliminated.

Table 3.10.3 Acoustical Mitigation Noise Barriers Analyzed

Barrier Number	Locations	Existing Hourly L_{eq} Noise Levels, dBA	Range of Future Hourly L_{eq} Noise Levels, dBA		Noise Reduction (dBA)	Barrier Characteristics		Cost[1]	Number of Units Attenuated	Cost/ Unit	Feasible and Reasonable
			Without Barrier	Barrier		Length (ft)	Height (ft)				
	City East Alternative										
1	West of M-25, between Hancock St. and Black River	59 - 73	61 - 73	52 - 61	5-13	2510	12-18	$1,591,739	44	$36,176	Yes
2	West of M-25, between Garfield St. and Hancock St.	58 - 68	61 - 70	55 - 62	5-11	865	15	$547,011	16	$34,188	Yes
	City West Alternative										
3	West of M-25, between Hancock St. and Black River	65-73	65 - 71	60 - 64	5-10	1,023	12-15	$591,629	8	$73,954	No
	Township Alternative										
4	West of I-94/69, north of Lapeer St.	59 – 70	64 – 72	59 – 61	5 – 11	1,838	12 - 18	$1,143,844	40	$28,596	Yes
5	West of M-25, between Hancock St. and Black River	59 – 73	56 - 70	51 – 63	5 – 13	2,488	12 - 15	$1,520,707	40	$38,018	Yes
6	West of M-25, between Garfield St. and Hancock St.	58 – 68	61 - 71	55 – 60	5 – 11	865	15	$547,011	18	$30,390	Yes

[1]Based on year 2007, estimates of $25.50 per square foot and an additional cost of $219.60 per lineal foot consistent with other noise walls constructed in the past.

3.11 Groundwater, Drainage, and Surface Water Quality

3.11.1 Are there any Critical Groundwater Resources in the Study Area?

The Study Area does not contain any Sole Source Aquifers or Critical Aquifer Protection Areas as defined by the Environmental Protection Agency under the authority of the Safe Drinking Water Act. As a result, no impacts are anticipated to groundwater resources.

Sole Source Aquifers

Supplies 50 percent or more of the drinking water in a given area.

3.11.2 How is Stormwater in the Study Area Currently Managed?

In the vicinity of the existing plaza, the stormwater runoff drains into the City of Port Huron's stormwater and combined sanitary/storm sewer system.

Existing I-94/I-69 areas around Water Street and the Black River Bridge drain to the Black River via overland flow and bridge drains.

3.11.3 What is Classified as Surface Water?

Surface waters are waters stored or flowing at the earth's surface including natural bodies of water (rivers, lakes, and wetlands), as well as water in human-made storage and conveyance facilities (lakes, detention ponds, and piped drainage systems). Discharges to these waters are regulated by the Clean Water Act. Impacts to surface waters can occur when vegetated areas are converted to hard surfaces such as pavement. When surface water, sometimes in the form of stormwater, cannot be absorbed by the ground, runoff occurs and water volumes increase. Changes in runoff volumes and velocities can cause stream bank erosion, bridge undercutting, and increased flooding risks.

The Clean Water Act

Provides for federal regulation of all sources of water pollution and prohibits the discharge of pollutants from non-permitted sources.

3.11.4 What Surface Water Features are Found in the Study Area?

The Study Area is located within the Black River watershed which includes the sub-watershed of Stocks Creek. **Figure**

3.11.1 shows the watersheds relative to the Study Area. In addition to these streams, a few wetlands are located within the Study Area, primarily near the Black River or Stocks Creek.

What is a Watershed?

The area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater.

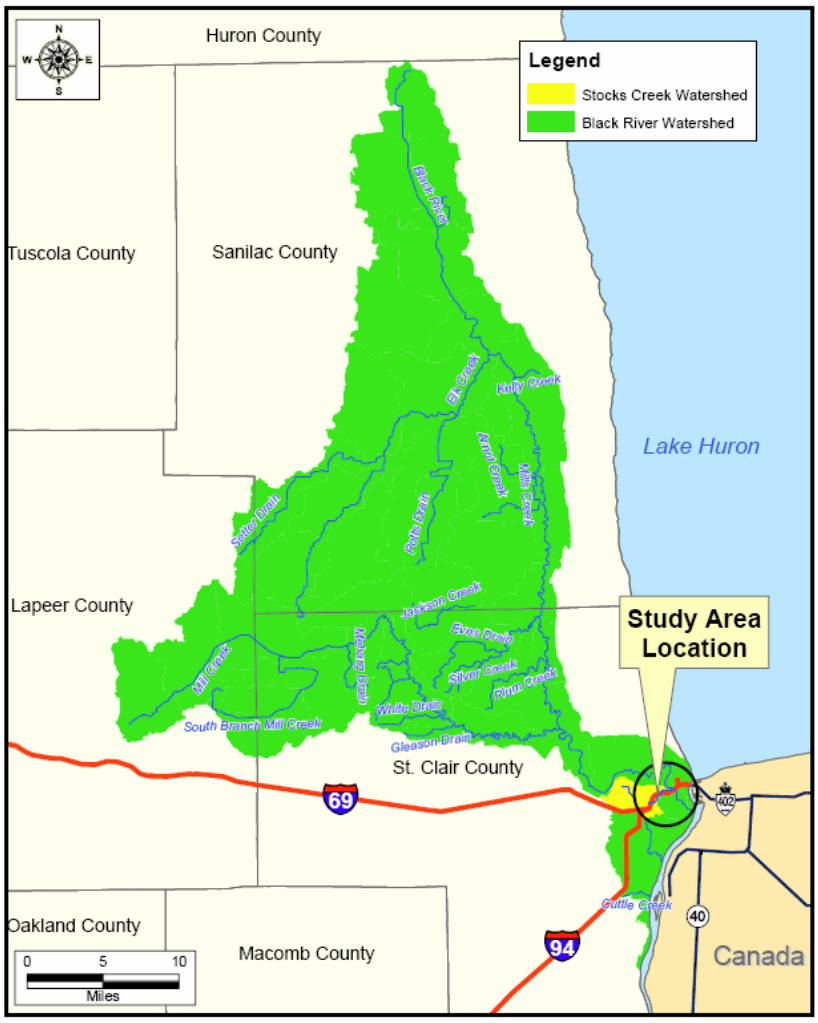


Figure 3.11.1 Black River and Stocks Creek Watersheds

In the eastern portion of the Study Area, the majority of the wetlands are associated with the Black River or Stocks Creek. Wetlands within the Study Area are evaluated and discussed in **Section 3.13, Wetlands.**

Black River: The headwaters of the Black River are located in the northern portion of Sanilac County. The river runs from north to south through Sanilac and St. Clair Counties before it discharges into the St. Clair River, in the City of Port Huron. The Black River crosses through the Study Area under the I-94/I-69 bridge, west of the existing plaza (**Figure 3.11.2**).

Within the Study Area the Black River is approximately 240 feet wide and approximately ten-feet deep. The bottom of the river is primarily composed of silt, clay and organic material. The existing I-94/I-69 Bridge over the Black River includes two piers in the river channel. At this location, the river has a wide, linear channel that has been dredged in the past. A public boat launch is located upstream of I-94/I-69 and the river has been widened immediately downstream, where marinas are present. The river banks indicate signs of erosion and contain large amounts of debris including old boats, broken concrete, and household trash.

Black River Under I-94/I-69

Stocks Creek: Stocks Creek originates to the west of the Study Area. The stream crosses under I-94/I-69 twice within the Study Area. The first location is just north of Lapeer Avenue. Stocks Creek runs from the west to the east at this point and crosses under I-94/I-69 perpendicularly through three side by side approximately two hundred-foot long, six-foot diameter corrugated metal culverts. The second location is just west of the Lapeer Connecter interchange with I-94/I-69. At this location, Stocks Creek runs from the south to the north and crosses under I-94/I-69 perpendicularly through an approximate 210-foot long, 12x8 foot, elliptical concrete culvert. North of this crossing, the stream turns east, crosses under Water Street, and eventually discharges into the Black River just north of the I-94/I-69 bridge over the Black River (**Figure 3.11.2**). Within the Study Area, Stocks Creek is approximately six-feet wide and two-feet deep. The bottom of Stocks Creek is primarily composed of sand and clay with some areas of gravel.

Stocks Creek

Corrugated Metal Pipe

3.11.5 How will the Project Affect Surface Water Features?

The following sections describe the potential impacts and proposed stormwater maintenance with each of the project alternatives.

Elliptical Concrete Culvert

No-Build Alternative: The No-Build Alternative would have minimal impact on surface water quality.


Blue Water Bridge Plaza Study
Surface Water Features & Floodplains
MDOT
Michigan Department of Transportation
Legend
Study Area
Interstate
Major Roads
Streams
Surface Water
100 Year Floodplain
500 Year Floodplain
Ontario, Canada
St. Clair River
Michigan
Blue Water Bridge
Black River
City of Port Huron
Port Huron Township
Stocks Creek
Price Drain
Baldwin Drain
Feet
Miles

Figure 3.11.2

City East Alternative: The City East Alternative would have minimal impact on surface water quality. The larger plaza and wider roadways included in the City East Alternative would increase the amount of paved surfaces, resulting in a greater discharge of stormwater into the surrounding water bodies. As a result, stormwater detention basins will be constructed to control the rate of water discharged to match the existing discharge rates. These detention basins would control water volume and preserve water quality. The proposed detention basins would be constructed in the grassy area of the Welcome Center between I-94/I-69 and passenger parking, and the east side of Stocks Creek, south of I-94/I-69. A 300-foot grassy buffer area would be constructed at each stormwater outlet prior to discharging into Stocks Creek or the Black River to help filter any suspended sediment prior to discharge.

What are Detention Basins?

Stormwater structures that temporarily detain runoff water prior to release to a stream or receiving waterway.

Currently the majority of runoff in the areas west of the Black River discharges into Stocks Creek. The proposed ditch flow patterns will be designed to match the existing conditions where feasible. Roadside and median ditches would be the primary drainage facilities for this alternative. Detention basins that discharge to roadside ditches are required for retaining wall sections.

The areas around Water Street will drain over land into a 300-foot grassy buffer area and then into Stocks Creek, just east of Water Street.

Stormwater runoff from the I-94/I-69 bridge over the Black River, will be directed toward the Black River. Stormwater drains on the bridge deck will not discharge directly into the Black River. Instead, the runoff from the bridge will be collected and channeled into a roadside ditch and through a 300-foot grassy buffer area to help filter any suspended sediment prior to discharging into the Black River.

The area to the east of the Black River is almost entirely drained by Port Huron's combined sanitary/storm sewer system. Stormwater concepts have been developed that discharge the proposed plaza stormwater to the existing City system or through vegetated controls toward the Black River.

An oil separator system would be used to provide pollutant removal (oil and solids) from the stormwater. Underground storage is required to reduce the peak flow, maintaining the existing flow level of the project into the City's system. Preliminary hydraulic analysis has been conducted which includes Hydrologic Engineering Centers River Analysis System (HEC-RAS) analysis and runoff calculations.

A more detailed hydraulic analysis will be performed during the FEIS phase for the Stocks Creek and Black River crossings to determine the size of the stormwater facilities necessary to adequately handle the proposed runoff.

City West (Preferred) Alternative: The Preferred Alternative would have slightly less of an impact to surface water quality than the City East Alternative due to a slight decrease in the total paved surface area. Stormwater from the proposed plaza would discharge into Port Huron's sanitary/sewer system or through vegetated controls toward the Black River, as is the case with the City East Alternative.

Stocks Creek at the Black River

Currently, runoff in the areas west of the Water Street Interchange discharges into Stocks Creek. The proposed ditch flow patterns will be designed to match the existing conditions where feasible. Roadside and median ditches would be the primary drainage facilities for this alternative. Detention basins that discharge to roadside ditches are required for retaining wall sections.

Based on preliminary drainage analysis, the areas around Water Street will drain over land into a 300-foot grassy buffer area and then into Stocks Creek.

The stormwater runoff from the Black River Bridge will be channeled into a roadside ditch and through a 300-foot grassy buffer area to help filter any suspended sediment prior to discharging into the Black River.

The area to the east of the Black River is almost entirely drained by Port Huron's combined sanitary/storm sewer system. Stormwater concepts have been developed that discharge the proposed plaza stormwater to the existing city system. An oil separator system would be used to provide

pollutant removal (oil and solids) from the stormwater. Underground storage or diversion chambers are required to reduce the peak flow, maintaining the existing flow level of the project into the city's system. Preliminary hydraulic analysis has been conducted.

A more detailed hydraulic analysis will be performed during the FEIS phase for the Stocks Creek and Black River crossings to determine the size of the stormwater facilities necessary to adequately handle the proposed runoff.

The Township Alternative: Similar to the City East and City West Alternatives, the Township Alternative would have minimal impact to surface water quality. The proposed plaza for the Township Alternative would be constructed in an area that is currently an abandoned farm field. This alternative would require paving a large area that is currently unpaved; therefore, the amount of stormwater runoff would increase. However, proposed detention basins would prevent an increase in the stormwater discharge rate into the natural water bodies. The detention basins will also improve water quality by allowing sediments to settle out prior to discharge. The detention basins for the Township Alternative are at the following locations: the northeast quadrant of the Water Street interchange; east and west side of Stocks Creek on the south side of I-94/I-69; and, the proposed plaza site. A 300-foot grassy buffer area will be constructed at each stormwater outlet to Stocks Creek or the Black River to help filter any suspended sediments prior to discharge.

Stocks Creek at Water Street

The drainage from the plaza site and roadways west of Water Street primarily discharge into Stocks Creek. The existing ditch flow patterns would be maintained. Roadside and median ditches are the primary drainage facilities for this alternative. Detention basins and enclosed storm sewers will be required for the secured lanes and retaining wall sections. These detention basins will discharge to the roadside ditches, as quickly as possible. An oil separator system will be provided to remove pollutants (oil and solids) from the storm-water.

The I-94/I-69 bridge over the Black River and Water Street area drainage concepts for the Township Alternative will be similar

to the City East and Preferred Alternatives. As part of the Township Alternative, the existing plaza, Hancock Street, and much of Pine Grove Avenue will be reconstructed. Stormwater will be discharged into the existing city system. To ensure that the city's stormwater system has the capacity to handle runoff from any new plaza development, stormwater will be discharged into detention basins prior to the release into the city system, at a rate equal to or less than pre-development flow rates. A more detailed hydraulic analysis will be performed at the Stocks Creek and Black River Crossings later in the design phase to size the stormwater facilities.

Surface water impacts to wetlands are discussed in **Section 3.13 Wetlands**.

3.12 Floodplains

3.12.1 What is a Floodplain?

A river, stream, lake, or open ditch can sometimes overflow their banks and flood nearby lands. The land that is flooded is defined as a floodplain. A 100-year floodplain is the land area that will be flooded by the overflow of water resulting from a 100-year flood.

What is a 100-year flood?

A flood which has a one percent chance of occurring any given year.

The floodplain is divided into two parts, the floodway which carries most of the flow during a flood event, and the floodway fringe which is an area of very slow moving water or "slack water". These are high hazard areas during times of flooding.

Executive Order 11988, Floodplain Management, dated May 24, 1977, implemented by DOT Order 5650.2, dated April 23, 1979, requires agencies to avoid disrupting floodplain areas wherever there is a practicable alternative, and to minimize any environmental harm that might be caused by the proposed action.

The State of Michigan's Floodplain Regulatory Authority, found in Part 31, Water Resources Protection, of PA 451, the Natural Resources and Environmental Protection Act (NREPA), as amended, requires that a permit be obtained prior to any alteration or occupation of the 100-year floodplain. The purpose of Part 31 is to assure that structures do not obstruct the flow of water in the 100-year floodplain, and that this portion of the floodplain is not used for residential construction. The Michigan Department of Environmental Quality (MDEQ), in cooperation with the U.S. Army Corps of Engineers, is the regulatory agency responsible for any construction activities within a given floodplain.

Black River Floodplain

3.12.2 Does the Study Area Contain any Floodplains?

The Black River and Stocks Creek are located within the Study Area. The Black River flows from the northwest to the southeast through the Study Area, has a drainage area of 707 square miles, and drains into the St. Clair River southeast of the Study Area. In this area, the Black River is considered

navigable, although the clearance at I-94/I-69 Bridge over the Black River, prevents large or tall boats from passing underneath. Depending on water levels, the existing boat clearance at the Black River Bridge is 15 to 20 feet. The existing clearance distance will be maintained or enlarged for any proposed structure. A Section 9 Permit will be required from the U.S. Coast Guard for the replacement of the Black River Bridge.

The Black River

The Black River floodplain located within the Study Area contains some scattered low-quality wetlands and habitat, but are mostly valued for stormwater control and pollution filters. On the east side of the Black River there is urban development and a local roadway located adjacent to the river. On the west side of the river, south of the freeway, there is a private marina, while on the north side of the freeway there is a local park. The parkland is mostly located within the floodplain and provides marginal wildlife habitat and limited plant diversity. There are no migratory bird-nesting sites on the parkland.

Stocks Creek is a tributary of the Black River and is not navigable. It flows east under I-94/I-69 into the Study Area just north of Lapeer Avenue, turns north and flows under I-94/I-69 just west of the Lapeer Connector, turns east and flows under Water Street and then into the Black River just north of the I-94/I-69 Black River Bridge. Stocks Creek at the I-94/I-69 crossing west of the Lapeer Connector has an associated floodplain and an upstream drainage area of 6.9 square miles. At this location, the Stocks Creek floodplain is mostly low lying emergent wetlands.

The Study Area contains 64.6 acres of land within the 100-year floodplains of the Black River and Stocks Creek. The location of the floodplain in the Study Area was identified by examining Flood Insurance Rate Maps (FIRM) published by the Federal Emergency Management Agency (FEMA). The approximate limit of the floodplain is shown in **Figure 3.11.2** in **Section 3.11 Groundwater, Drainage, and Surface Water Quality**.

3.12.3 How will the Project Impact Floodplains?

Efforts have been made to design project alternatives that will minimize impacts to the floodplains. Any impact to the 100-year floodplain will be offset by providing additional storage capacity for flood waters. This is referred to as compensatory storage. Compensatory storage balances the loss of natural flood storage capacity within the floodplain. The MDEQ requires compensatory storage if more than 300 cubic feet of fill material is placed in the 100-year floodplain.

A hydraulic analysis was performed and determined that the 100-year flood elevation at the I-94/I-69 bridge crossing over Black River is 586.14 feet, and 585.91 feet at the I-94/I-69 Stocks Creek crossing just west of the Lapeer Connector. The lowest elevation of the existing bridge deck is 596.00 feet, which is about ten-feet higher than the 100-year flood elevation. Additionally, the lowest roadway elevation on the I-94/I-69 approaches is 594.78 feet, which is approximately eight-feet higher than the 100-year flood elevation. The proposed Black River Bridge improvements will be at or above these existing elevations and, therefore, will be protected from water flooding over the roadway/bridge in the event of a 100-year flood.

The design of the new bridge over the Black River will increase the existing opening under the bridge. This will help to offset any proposed fill in the 100-year floodplain, improve water flow under the bridge, and ensure that no upstream flood elevations are affected.

As a result, there would be no impacts on natural and beneficial floodplain values, there would be no change in flood risks, and there would be no increase in potential for interruption or termination of emergency service or emergency evacuation routes.

No-Build Alternative: The No-Build Alternative would have no effects on the 100-year floodplain.

Build Alternatives over the Black River: The City East, City West, and the Township Alternatives would require the Black River Bridge and associated approaches to be significantly widened

from the existing four lanes. Both the City East and City West Alternatives would require nine lanes while the Township Alternative would require ten lanes. This widening would require the placement of fill material within the 100-year floodplain west of the Black River Bridge along both sides of I-94/I-69. The City East and City West Alternatives would require approximately 625 cubic yards and the Township Alternative would require approximately 2,450 cubic yards. Although the Township Alternative is only one lane wider than both City Alternatives, the Township Alternative's width is much greater than both city alternatives due to shoulders and security features. Compensatory storage will be provided by lengthening the bridge over the Black River to ensure that the new bridge would not impact 100-year floodplain elevations. Fill for the longer bridge will be required at the Water Street ramp locations, which will be above the 100-year floodplain elevations.

Mouth of Stocks Creek at the Black River

To ensure that all environmental and hydraulic impacts associated with the floodplain crossings of the Preferred Alternative are minimized, further evaluation of crossing options will be conducted during the design phase. This would include an examination of bridge spans and approaches, median widths, and side slopes. The analysis would consider existing and proposed conditions, and would determine the necessary and proper bridge types, openings, lengths, and locations of abutments and piers to minimize or eliminate floodplain impacts. A preliminary hydraulic analysis has concluded that the proposed I-94/I-69 bridge over the Black River provides a greater waterway area through the structure than the existing and the proposed spans on the west bank, do not negatively affect the waterway area.

Build Alternatives over Stocks Creek: Currently, Stocks Creek runs from the south to the north and crosses under I-94/I-69 perpendicularly through an approximate 210-foot long, 12x8-foot, elliptical concrete culvert. The Township Alternative would require two bridge or culvert structures crossing Stocks Creek to accommodate the six-lanes of the secured corridor and the six-lanes of the M-25 Connector. The two new structures would be separated by an open grassy median approximately 170-feet wide. At this time the proposed structures are each anticipated to be between 130

and 250-feet long. A new single-span bridge structure is proposed for both city alternatives. The bridge will be continuous in length under both the eastbound and westbound lanes of freeway and is anticipated to match the existing 210-foot length. A preliminary hydraulic analysis has concluded that the proposed single-span structure would not create an adverse effect on the hydraulic capacity and efficiency of the Stocks Creek crossing.

3.13 Wetlands

Wetland delineations and assessments were conducted in the Study Area to identify locations and sizes of wetlands, assess the functions associated with each wetland, and identify the potential wetland impacts of each alternative. Wetland function is defined by the beneficial effects of a wetland on the surrounding environment. The methods used for wetland identification were based on Part 303, Wetland Protection of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, as well as guidance manuals and procedures set forth by the Michigan Department of Environmental Quality.

What is a Wetland Delineation?

The process used to determine the size and type of a wetland.

3.13.1 Why are Wetlands Important?

Wetlands play a significant role in the health and existence of other natural resources such as inland lakes, ground water, fisheries, and wildlife. Michigan's wetland statute recognizes the following benefits provided by wetlands:

- Flood and stormwater control through absorption and storage
- Provide habitat for many forms of wildlife including migratory waterfowl and rare, threatened, or endangered species
- Protection of ground water resources, watersheds and the ability to recharge ground water supplies
- Pollution treatment by serving as a filter to purify surface water
- Erosion control by serving as a filtering basin, absorbing silt and organic matter
- Sources of nutrients in water food cycles and nursery grounds and refuge for fish

These benefits are often referred to as wetland functions and values.

3.13.2 How were Wetlands Identified?

Before the field investigations began information was gathered from several sources to provide direction and focus. The Study Team reviewed the U.S. Department of Agriculture's

What are hydric soils?

A soil that is saturated long enough during the growing season to deprive the root system of oxygen, likely indicating a wetland.

Soil Survey for St. Clair County and the U.S. Fish and Wildlife Service's National Wetland Inventory Map for the Study Area, to identify potential wetland areas. Wetland specialists then developed field maps by overlaying hydric soil maps and wetland area maps with land features on aerial photography. The wetland specialists used these maps to identify the approximate location and size of potential wetland complexes within the Study Area.

Wetland boundaries were identified based on the presence of wetland plants, visual signs of water, elevation changes, and the presence of hydric soils. Functions, values, benefits, and uses that each wetland provides were determined. The wetlands were then rated as low, medium, or high quality based on the presence or absence of functions and values and the degree of benefits those functions and values provide.

Invasive Species

Are introduced, non-native plants that out-compete native plants for space and resources.

The wetland specialists conducted an inventory of all plant species present within each wetland area. The plant species were entered into the Michigan Department of Natural Resources' database. This database was used to calculate and assess the quality of each wetland. Wetlands with fewer invasive species and more native species were given a higher rating than those having a larger number of invasive species and fewer native plants.

Scrub-shrub/forested wetland

Fifty-six (56) wetland areas were delineated and assessed within the Study Area during the summer and fall of 2003. Eighteen (18) of the wetland areas are roadside ditches and were not included in the impact evaluations because they are not regulated wetlands. The remaining 38 wetland complexes contain emergent, scrub-shrub, forested, and open water wetlands. Emergent wetlands are those that contain plants that root in water for much of the year, but grow tall enough to stick out of the water. Scrub-shrub is a term used to define a wetland that contains small trees and bushes less than 20-feet tall, while a forested wetland typically contains trees greater than 20-feet tall. Of these 38 wetlands, five were classified as high quality, 11 were classified as medium quality, and 22 were classified as low quality wetlands (**Table 3.13.1**). Most of the wetlands in the Study Area are less than 0.5 acre in size.

Table 3.13.1 Type and Acreage of Wetlands in the Study Area

Wetland Type (in acres)									
	OW	**FO**	**FO SS EM**	**FO SS**	**FO EM**	**SS**	**SS EM**	**EM**	**Total**
Total	0.67	2.74	1.07	1.62	0.04	0.68	1.33	4.13	12.28

OW-Open Water Wetland
FO-Forested Wetland
SS-Scrub/Shrub Wetland
EM-Emergent Wetland

The majority of the wetlands within the Study Area are located west of Water Street along I-94/I-69, (**Figure E.26** in **Appendix E**). The eastern portion of the Study Area is more urbanized with wetlands located primarily along the Black River. These wetlands are dominated by invasive plant species and contain significant amounts of garbage and debris. However, these types of wetlands, adjacent to rivers, lakes and streams, can provide higher water quality functions, erosion control, and wildlife habitat.

Two wetland areas adjacent to Stocks Creek represent the highest quality and largest wetlands within the Study Area. These wetlands are located on the north and south side of I-94/I-69, just west of the Lapeer Connector. Both of the wetlands border Stocks Creek and provide flood storage, water filtration, nutrient uptake and erosion control functions, in addition to wildlife habitat. It is likely that these two wetlands were historically one complete wetland complex that was fragmented at the time I-94/I-69 was initially constructed.

3.13.3 How Many Acres of Wetland will be Impacted?

Of the 38 regulated wetlands in the Study Area, 29 could potentially be impacted by the project. The City East and City West Alternatives would impact 17 wetland areas, while the Township Alternative would impact 29 wetland areas which include the 17 wetlands impacted by both the City Alternatives. Wetland impacts include filling the wetlands partially or entirely.

Table 3.13.2 illustrates the type and acreage of wetlands that will be impacted by each alternative. Emergent, scrub/shrub, and open water wetlands are separated from forested wetlands as the mitigation ratio for impacting these wetlands differs from the others. Emergent, scrub/shrub, and open water wetlands require 1.5 acres of wetland to be created for every one-acre of impact. Forested wetlands require two acres of wetland to be created for every one-acre of impact. Mitigation requirements for wetland impacts are discussed further in **Chapter 5 Mitigation**.

Table 3.13.2 Estimate of Wetland Impacts

Project Alter-natives	Number of Regulated Impacted Wetlands	Type and Acreage of Wetland Impacts			Acres of Highest Quality Wetland Impacts
		Emergent, Scrub-Shrub and Open Water	Forested	Total	
No-Build	0	0	0	0	0
City East Alt.	17	3.24	1.12	4.36	1.31
City West Alt.	17	3.24	1.12	4.36	1.31
Twp. Alt.	29	7.22	2.94	10.16	3.80

No-Build Alternative: There would be no impact to any wetland under this alternative.

City East Alternative: Proposed improvements for the City East Alternative are concentrated in the northeastern portion of the Study Area where the Black River and linear roadside ditches are present. This alternative would impact a total of 4.36 acres of wetland within 17 wetland areas (**Figure 3.13.1**). Twelve wetland areas would be partially impacted and five would be entirely removed by this alternative. These wetlands have relative low value, function, and floristic significance.

City West (Preferred) Alternative: As with the City East Alternative, the proposed improvements for the City West Alternative are concentrated in the northeastern portion of the

Study Area where the Black River and linear roadside ditches are present. The Preferred Alternative would have the same impacts as the City East Alternative, a total of 4.36 acres of wetland within 17 wetland areas (**Figure 3.13.1**). Twelve (12) wetland areas would be partially impacted and five would be entirely removed by this alternative. These wetlands have relative low value, function, and floristic significance. Mitigation measures to offset potential wetland impacts are discussed in **Chapter 5 Mitigation**.

Township Alternative: The Township Alternative would impact approximately 10.16 acres of wetlands located within 29 wetland areas. Nine wetlands would be partially impacted and 20 would be entirely removed with this alternative. **Figure 3.13.2** shows the locations of impacted wetlands for this alternative. The majority of the wetlands impacted by the Township Alternative are small, isolated, and have relatively low overall function, value, and floristic significance.

The wetlands adjacent to Stocks Creek would experience the most impact. These wetlands provide the highest diversity of wildlife habitat and the greatest water quality functions within the Study Area. Approximately one-third of the wetland acres that would be impacted by this alternative are associated with these three wetlands. Mitigation measures to offset potential wetland impacts are discussed in **Chapter 5 Mitigation**.

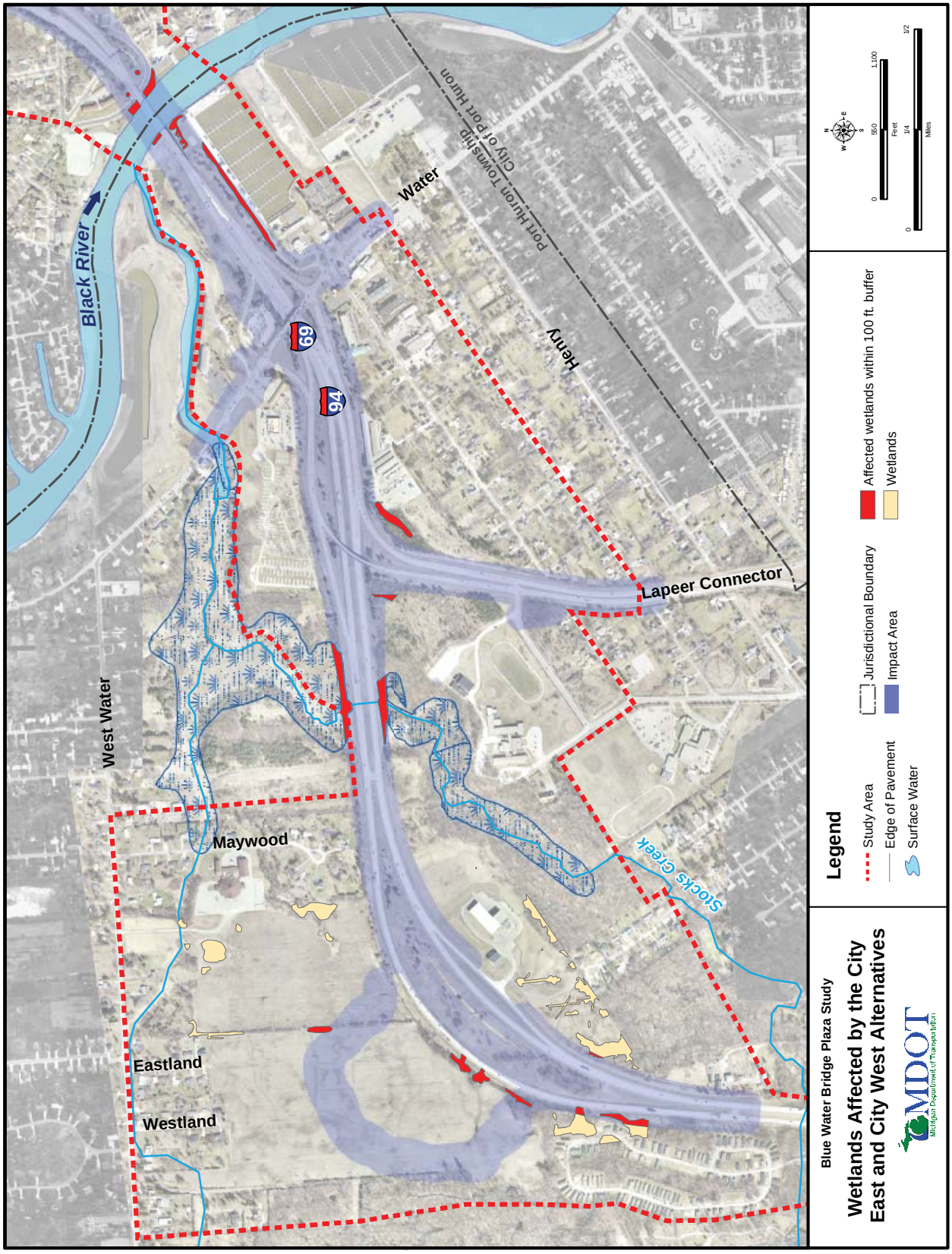

Blue Water Bridge Plaza Study
Wetlands Affected by the City
East and City West Alternatives
MDOT
Michigan Department of Transportation
Legend
Study Area
Edge of Pavement
Surface Water
Jurisdictional Boundary
Impact Area
Affected wetlands within 100 ft. buffer
Wetlands
0
550
1,100
Feet
0
1/4
1/2
Miles
Black River
West Water
Water
Port Huron Township
City of Port Huron
Henry
69
94
Lapeer Connector
Maywood
Stocks Creek
Eastland
Westland

Figure 3.13.1

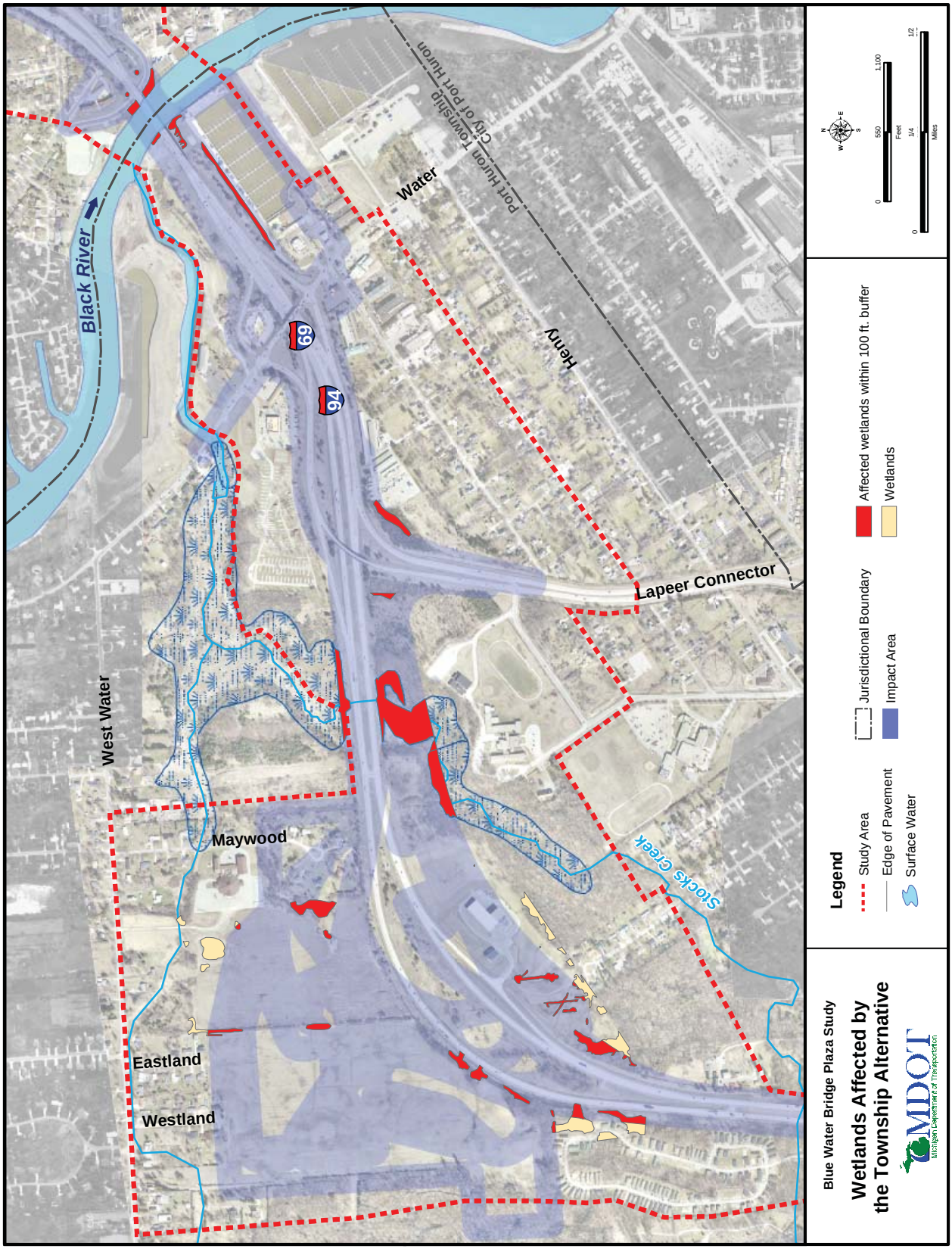

Blue Water Bridge Plaza Study
Wetlands Affected by the Township Alternative
MDOT
Michigan Department of Transportation
Legend
Study Area
Edge of Pavement
Surface Water
Jurisdictional Boundary
Impact Area
Affected wetlands within 100 ft. buffer
Wetlands
0
550
1,100
Feet
0
1/4
1/2
Miles
Black River
West Water
Port Huron Township
City of Port Huron
Water
Henry
Lapeer Connector
69
94
Maywood
Stocks Creek
Eastland
Westland

Figure 3.13.2

3.14 Plants, Wildlife, and Threatened and Endangered Species

The following sections explain the effects that the project alternatives will have on plants, wildlife and threatened and endangered species in the Study Area. Threatened and endangered species is the classification given to a plant or animal that is in danger of extinction throughout all or a large portion of their range, or are likely to become endangered in the future. As discussed below, none of the alternatives would have significant impacts on plants and wildlife. No threatened and endangered species were found in the Study Area.

3.14.1 What Methods were Used?

The identification of plants, wildlife and threatened and endangered species consisted of record searches and field investigations. Information was obtained from the following sources to provide initial direction and focus for field assessments: The United States Department of Agriculture Soil Survey for St. Clair County, St. Clair County Plat Book, St. Clair County Element List courtesy of the Michigan Department of Natural Resources, and United States Fish and Wildlife Service federal list of threatened and endangered species and National Wetland Inventory maps. A request was made to the Michigan Department of Natural Resources and Michigan Natural Features Inventory for records and information on state threatened or endangered species, and species of concern previously identified within the Study Area or surrounding areas (see **Agency Early Coordination Letters in Appendix D.1**).

These resources allowed qualified biologists to focus on specific species and habitats during the field reviews of the Study Area. Specific target species and target habitat were identified based on information received from the Michigan Department of Natural Resources and the Michigan Natural Features Inventory. Target species are state or federally listed as threatened, endangered, or species of concern and determined by past studies and literature reviews to potentially live in the Study Area. Target habitats are those

What is habitat?

An area that provides an animal or plant with adequate food, water, shelter, and living space.

habitats identified in the literature and past studies that support the target species.

Field investigations were conducted in accordance with Section 365 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and "Guidelines for Conducting Endangered and Threatened Species Surveys", as set forth by the Endangered Species Coordinator with the Wildlife Bureau, Michigan Department of Natural Resources. Field inspections included a minimum of two qualified biologists visually inspecting all of the Study Area and recording all observations of plant and animal species present. Biologists recorded each different community type on aerial photography maps (see **Threatened and Endangered Species Assessment Technical Memorandum**).

3.14.2 What does the Existing Environment Look Like?

The following paragraphs discuss the existing plant habitats, wildlife habitats and threatened and endangered species that are found in the Study Area.

Farm field near the Study Area

Habitats: Thirty-three distinct community types were identified within the Study Area. The majority of these areas consist of developed land, disturbed land, farm field, old field, road side ditches, maintained right-of-way, and segmented wetland areas with relatively low native plant diversity. Native plants are those species that occur naturally in any given area. The habitat types located in the Study Area are typical for Southeastern Michigan.

Wildlife: Based on field surveys, the plant communities in the Study Area provide the type of wildlife habitat that includes many introduced/exotic plants and supports some animal species found in Southeastern Michigan. These plant communities can provide protective cover, nesting/denning sites, and food sources for a variety of wildlife species. However, due to the existing development in the Study Area, wildlife diversity is limited to those species which are tolerant of human activities.

Threatened and Endangered Species: Threatened and endangered species surveys were conducted from September 2003 through July 2004. Two animal species, the spotted turtle (*Clemmys*

guttata) and round hickory-nut mussel (*Obovaria subrotunda*), were identified by the Michigan Department of Natural Resources and the Michigan Natural Features Inventory as having potential to exist within the Study Area. The spotted turtle is a state threatened species while the round hickory-nut mussel is a state endangered species.

The spans of the Blue Water Bridge provide habitat for the Peregrine Falcon (*Falco Peregrinus*) and have been monitored by the Michigan Department of Natural Resources since 2005 because the State of Michigan considers them to be an endangered species. The bridge spans are outside of the study limits of this project and the falcon habitat will not be affected by any of the alternatives.

Spotted Turtle: The spotted turtle can live in many different types of wetlands, but is typically found in bogs, boggy ponds, fens, sphagnum seepages, and grassy marshes. This species prefers shallow, clean water with mud bottom and clumps of sedge or marsh grass (Lee 2000). Nesting occurs in mid-June on well-drained soils that receive full sunlight.

Fens, bogs, and sphagnum seeps are not present within the Study Area. However, grassy marshes are present in habitat areas 16 and 17 as shown on **Figure 3.14.1**. These areas are dominated by reed canary grass and open water is present, but only within the banks of Stocks Creek.

The Michigan Natural Features Inventory indicated that the marsh near Stocks Creek is potential spotted turtle habitat. This marsh includes Areas 16, 17, and 18 as shown in **Figure 3.14.1.** Area 16 consists of a large emergent and wet meadow wetland near Stocks Creek. It is surrounded by upland slopes where potential spotted turtle nesting habitat could exist. These areas were surveyed throughout the study period. Although these areas contain potential habitat for the spotted turtle, no spotted turtles were observed.

Round Hickory-nut Mussel: The round hickory-nut mussel is most commonly found near the mouth of medium and large rivers with moderate flow and sand and gravel bottoms (Carman 2001). The Michigan Natural Features Inventory identified the Black River as potential habitat for this mussel

What is a bog?

A bog is a type of wetland that builds up peat, has no inflows or outflows of water, and is acidic.

Spotted Turtle

What is a fen?

A fen is a nutrient rich, organic wetland influenced by mineral-rich groundwater.

What is a wet meadow?

A wet meadow is a grassland with waterlogged soils.

Round Hickory-Nut Mussel

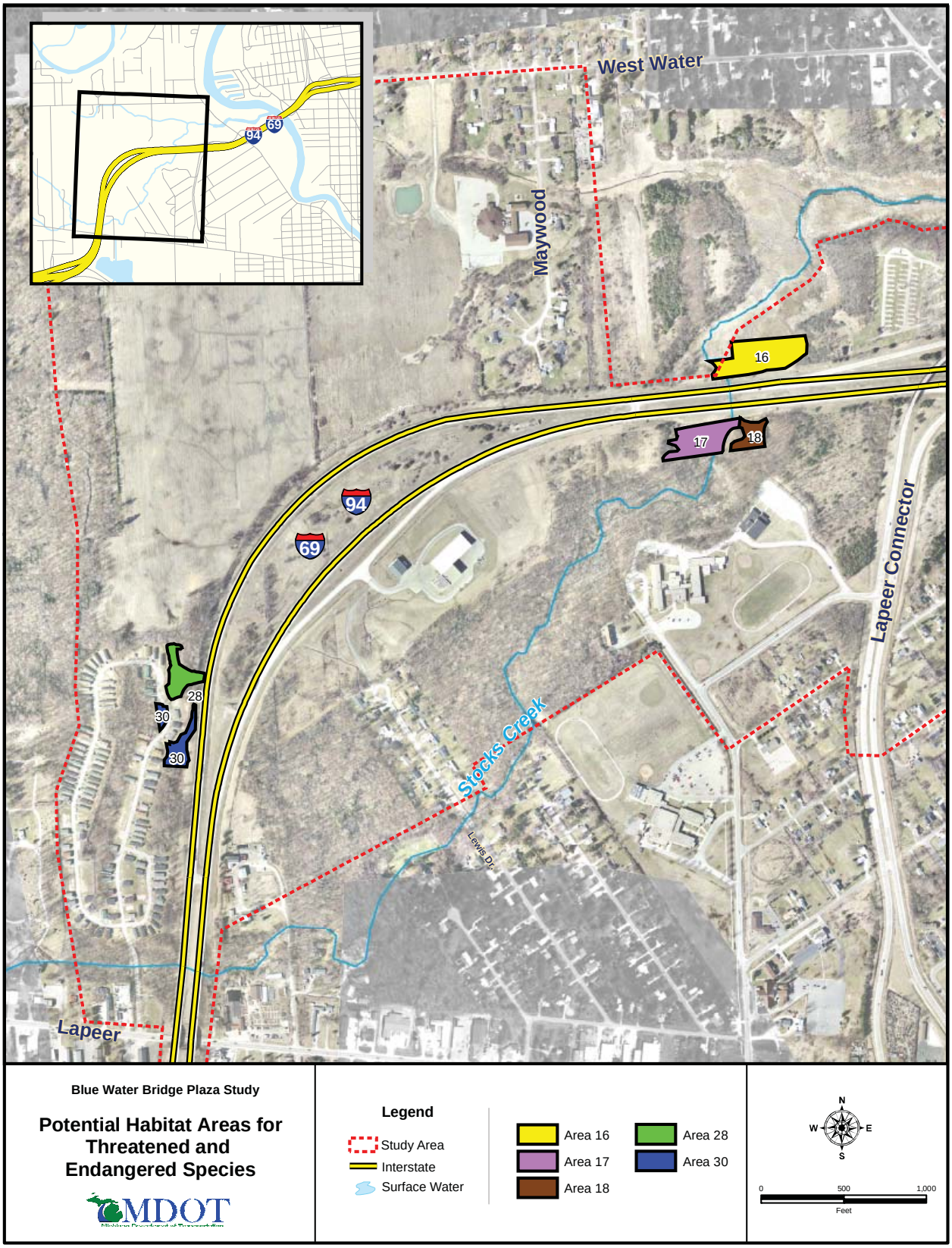

West Water
Maywood
Lapeer Connector
Stocks Creek
Lewis Dr.
Lapeer
16
17
18
28
30
30
94
69
Blue Water Bridge Plaza Study
Potential Habitat Areas for Threatened and Endangered Species
MDOT
Legend
Study Area
Interstate
Surface Water
Area 16
Area 17
Area 18
Area 28
Area 30
N
W
E
S
0
500
1,000
Feet

Figure 3.14.1

species. Within the Study Area the Black River has a wide, straight channel that has been dredged in the past. Water clarity in the river was low during all site visits. Boat launches are located upstream and downstream of the Black River Bridge. The Black River has been widened downstream of the bridge near the existing marinas. Riverbanks show signs of erosion and contain large amounts of debris including old boats, broken concrete, and household garbage.

Investigations for the round hickory-nut mussel focused on water quality and river bottom substrates in the Black River. Fourteen sediment samples were collected from the Black River. Twelve of the 14 samples were made up of fine sediments dominated by silts, clays and organics. Two samples collected at the mouth of Stocks Creek consisted of coarse sands that are similar to habitat preferred by the round hickory-nut mussel. No round hickory-nut mussels were found in any of the samples.

Plant Communities: No threatened, endangered or special concern plant species were found in the Study Area. None of the identified community types contain a Floristic Quality Index (FQI) value that would be considered high. The better a plant community is, the higher it's floristic quality index and the possibility of it containing threatened, endangered, or special concern plant and animal species. On the other hand, plant communities that are impacted by many types of human disturbances have more invasive plant species, lower FQI values, and less chances of containing threatened, endangered, and/or species of concern.

What are invasive species?

Invasive species are introduced, non-native species that out compete native species for space and resources.

Five of the 33 habitat areas identified consist of large or diverse wetland complexes. While these areas are not believed to have threatened and endangered plant species, they are identified as the highest quality habitats in the Study Area. More discussion on wetlands in the Study Area is located in **Section 3.13 Wetlands**.

Fish and Aquatic Biota: To determine the biological quality of the Black River and Stocks Creek within the Study Area, the biological makeup of the watercourses was sampled by aquatic biologists according to the Great Lakes Environmental Assessment Section (GLEAS), Procedure #51, *Qualitative*

Biological and Habitat Survey Protocols for Wadable Streams and Rivers (1997). The survey provided an evaluation of the macroinvertebrate and fish communities along with the quality of aquatic habitat present in the Study Area.

What are macroinvertebrates?

Macroinvertebrates are invertebrates visible to the naked eye, such as insects crayfish, and worms. Macroinvertebrate studies provide a good environmental indicator of stream health because many species are known to be either tolerant or intolerant of pollution.

Black River: The Black River is a warm water stream with cool water fisheries. Results of Black River surveys indicated poor water quality conditions with degraded habitats and poor macroinvertebrate communities. In consolation with MDNR it was determined that sampling for fish was not necessary. However, discussions with the MDNR, Fisheries Division, revealed that the Black River receives annual spawning runs of steelhead (*Oncorhynchus mykiss*) and chinook salmon (*Onchorhychus tshawytscha*). Spawning is not known to occur within the Study Area, but does occur in upstream reaches, where hard, gravel and cobble bottom substrates are present. In addition, a large emergent wetland system is present immediately upstream of the confluence of Stocks Creek that contains potential nursery, spawning, and feeding habitat for a variety of warm and cool water fish species.

Stocks Creek: The habitat quality associated with Stocks Creek is good to excellent. However, fish and macroinvertebrate communities are indicative of a stream with lower water quality. One reason for the degraded biological communities may be a lack of connection to higher quality in-stream habitats. Between the sampling locations in Stocks Creek and the Black River, Stocks Creek has been altered and appears to be highly degraded, perhaps eliminating fish migration between systems. Upstream influences may also be contributing to degraded water quality. However, a more detailed analysis would be required to identify specific reasons for the lack of aquatic macroinvertebrate diversity where relatively good physical habitat is present.

3.14.3 Will the Project Impact any Plants, Wildlife, or Threatened and Endangered Species?

The following paragraphs describe the potential impacts caused by each of the alternatives.

No-Build Alternative: The No-Build Alternative would have little or no impact on the plants, wildlife or threatened and endangered species within the Study Area.

Build Alternatives: Of the Build Alternatives, the Township Alternative would have more impacts than the City Alternatives on the plants, and wildlife within the Study Area. However, none of the Build Alternatives would have a significant impact.

Wildlife: Because the impacted areas are near existing roads and developed areas, the plant communities that would be eliminated are not considered good wildlife habitat. Wildlife species that would be affected are common in the surrounding area, tolerant of noise and visual disturbances, and would easily relocate to similar habitats.

Threatened and Endangered Species: No state or federally threatened and endangered animal species were found within the Study Area. However, habitat areas that could be used by the spotted turtle are present within Areas 16, 17, and 18 (**Figure 3.14.1**). The Township Alternative is the only alternative that impacts these areas. The majority of impact is associated with Areas 17 and 18 where the habitat quality for the spotted turtle is low. Although the Township Alternative impacts Area 16, the impacts would be small because most of the work is restricted to the existing road right-of-way.

All of the alternatives impact the Black River, where the round hickory-nut mussel has been previously recorded to occur. Sediment samples revealed that habitat for the mussel is not present within the Study Area and Alternatives are not expected to impact the mussel or its habitat.

Black River Bridge

Special care will be given when working in potential spotted turtle habitat. The spotted turtle hibernates in shallow water under the mud through out the winter. No work will occur in wetland areas adjacent to Stocks Creek between mid-October and the end of March. During construction, thorough searches will be conducted for the turtle within the work area. Any turtles found will be relocated to an appropriate safe area. Barriers will also be constructed to prevent re-entry of the turtle into the work area.

No threatened and endangered plant species were found within the Study Area. All plant communities within the Study Area were found to be low quality. However, five habitat areas (16, 17, 18, 28, and 30), shown in **Figure 3.14.1**, have relatively high plant diversity and/or are larger wetland complexes that provide wildlife habitat. While these areas did not have threatened and endangered plant species, they were identified as having the highest quality native plant assemblage within the Study Area. Habitat Areas 28 and 30 would not be affected by the Build Alternatives. The Township Alternative would have minor impacts to Areas 16, 17, and 18.

Habitat Area 16 contains large areas of reed canary grass, an invasive species, with no open water areas except within the banks of Stocks Creek. Area 17 contains wet meadow and scrub-shrub areas near Stocks Creek, and Area 18 contains forested wetland and seasonal standing water.

Minor impacts are anticipated in Area 16, along the I-94 /I-69 right-of-way. These impacts would be associated with new lane construction necessary to accommodate traffic to and from the Blue Water Bridge crossing, and off-site plaza areas to the west. The majority of the impacts to plant communities would occur in Areas 17 and 18, within the area of Stocks Creek. Relocation of the new lanes to the north would minimize impacts to the more diverse habitats associated with areas 17 and 18, but would require greater impacts to habitats associated with area 16.

Plants: The Township Alternative is the only alternative that impacts higher quality plant habitats within the Study Area. Impacts are not expected to be major with any build alternative. No unique or special plant communities exist within the Study Area and any species that would be affected are common to urbanized areas in the vicinity of the Study Area.

Fish and Aquatic Biota: Overall impacts to the fish and aquatic biota within the Black River are expected to be minimal under all of the alternatives. Surveys conducted in the Black River indicate the biotic habitat to be poor and a macroinvertebrate community tolerant of poor water quality conditions. Bridge

construction could result in loss of specific areas for macroinvertebrate production, however overall impacts are expected to be minor.

Stocks Creek could potentially be impacted by the Township Alternative through the extension of the stream enclosure under I-94/I-69 and the new M-25 Connector extension. The existing Stocks Creek structure is 210 feet in length. The new Stocks Creek structure for I-94/I-69 would be approximately 130 feet while the new structure for the M-25 Connector would be approximately 250 feet. These two structures would be separated by approximately 170 feet of open median. An increase in the Stocks Creek stream enclosure could result in negative resource impacts to the creek. Stream enclosures can result in significant habitat changes, essentially eliminating bottom bank, and other in-stream habitats. These impacts could result in migration barriers to fish, excluding them from areas of required or preferred habitats. Enclosures also eliminate sunlight penetration, which is necessary for primary production. Loss of primary production results in a reduction in food sources in downstream waters, thereby reducing fish and macroinvertebrate production. All efforts will be made during the design phase of the project to minimize the length of stream enclosures to Stocks Creek.

What is primary production?

The growth produced by the organisms on the bottom of the food chain (plants, algae), which fuels the rest of the food chain.

For both the City East and City West Alternatives, the new Stocks Creek structure would be the same length as the existing structure, 210 feet.

3.15 Cultural Resources

This section discusses the potential effects the project would have on historic buildings, historic sites, and archaeological sites. Collectively these sites and the structures or artifacts they contain are called cultural resources.

To satisfy Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act, MDOT coordinated with the Michigan State Historic Preservation Office (SHPO) to identify an Area of Potential Effect (APE) for the project. The SHPO recommended that MDOT conduct historic and archaeological surveys to locate sites eligible for listing on the National Register of Historic Places (NRHP).

Native American Consultation: The Study Team sent an early coordination letter dated, October 10, 2002, to the federally recognized Saginaw Chippewa Indian Tribe. The Saginaw Chippewa Tribe responded in a letter dated November 12, 2002, stating that they do not have any information concerning the presence of any Indian Traditional Cultural Properties, Sacred Sites, or other Significant Properties in the APE.

The APE for this project is the same as the Study Area, a 924-acre area roughly centered on the Blue Water Bridge Plaza in Port Huron, St. Clair County, Michigan along with parts of the Study Area in Port Huron Township. The APE addresses a worst-case scenario for the potential 2030 footprint of the future plaza. The Study Team evaluated historic structures and performed archaeological field exploration and testing as needed. The Study Area for cultural resources, shown in **Figure E.21**, located in the separate **Appendix E** volume, has generally been determined as the limits of the APE.

What are Cultural Resources?

Sites, structures, landscapes, and objects that are of some importance to a culture or community for scientific, traditional, religious, or other reasons.

What is the State Historic Preservation Office (SHPO)?

Established by the National Historic Preservation Act of 1966, the SHPO is an agency within each state, territory and protectorate government charged with enforcing the provisions of the Act. SHPOs receive federal funds from the National Park Service and allocate matching funds and grants to local agencies and private citizens for the protection of sites eligible for listing in the National Register of Historic Places.

3.15.1 How did the Study Team Identify Historic Properties?

Study Team historians conducted a study to identify potential historic properties within the Study Area that potentially meet the minimum criteria of eligibility for listing on the NRHP. The NRHP has established criteria for determining historic significance. These criteria require a property to have

What is the National Register of Historic Places (NRHP)?

The official list of cultural resources worthy of preservation maintained by the National Park Service. Authorized under the National Historic Preservation Act of 1966, the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.

What is the Area of Potential Effect (APE)?

The geographic area or areas within which a project may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effect is influenced by the size and nature of a project and may be different for different kinds of effects caused by the project.

integrity of location, design, setting, materials, workmanship, feeling, and association. To be eligible, properties typically must be at least 50 years old, remain fairly unaltered, and meet one or more of the National Register criteria for significance:

A) Property is associated with events that have made a significant contribution to the broad patterns of our history

B) Property is associated with the lives of persons significant in our past

C) Property represents the distinctive characteristics of a type, period, or method of construction; or represents the works of a master; or possesses high artistic values; or represents a significant and distinguishable entity whose components lack individual distinction

D) Ability to yield information important in prehistory or history

Previous surveys for above-ground cultural resources were conducted within the APE. These surveys included a 1983 survey for improvements planned to the Blue Water Bridge Plaza at that time. St. Clair County also performed an inventory of historic structures countywide in 1983. Of the 102 structures inventoried by both surveys, none were recommended as eligible for listing on the NHRP. Currently 35 of the 102 previously surveyed structures still exist.

In 1994, an updated Environmental Report was produced for the second Blue Water Bridge and earlier plaza improvements. At that time, the only recognized resource eligible for the NRHP within that study's Area of Potential Effect (APE) was the original Blue Water Bridge itself. By that time, the original plaza had been documented, demolished, and reconstructed.

3.15.2 What Historic Properties are in the Study Area?

The Study Team conducted a Cultural Historic Survey for above-ground cultural resources in March and September 2003 and identified an additional 184 structures older than 50 years of age in addition to those 35 structures that were previously

surveyed. In total, the Study Team assessed the eligibility for 219 structures for listing on the National Register of Historic Places. Of these, only one structure, located at 2511 10th Avenue and known as the E.C. Williams House, was recommended as eligible for the NRHP.

The E.C. Williams House is a Registered Michigan Historic Site, and is eligible for the NRHP under Criterion B for its association with E.C. Williams, a prominent local newspaper publisher in the area's history. It is also eligible for the NRHP under Criterion C, as an excellent example of an early Queen Anne duplex residence.

3.15.3 Are there Archaeological Sites in the Study Area?

Prior to any archaeological field work, the Study Team researched the archives for the area and discovered one previously recorded archaeological site (20SC155) within the Area of Potential Effect. This site has been determined as ineligible for listing on the NHRP. In a letter dated September 18, 2003, from the SHPO to MDOT, SHPO stated that the area of the project between Stock's Creek and the existing plaza required no survey. As site 20SC155 is located within this area, SHPO determined no further work was necessary.

Also within the 2003 letter, SHPO requested that the Study Team archaeologists conduct deep testing on both sides of the Black River. September 2, 2004, the deep testing was conducted by a geomorphologist who assessed the disturbance on the east side of the Black River and recommended no further work. On the west side of the Black River, however, five trenches measuring approximately six yards in length were excavated. These trenches were placed approximately 66-yards to 131-yards apart with the last trench (Trench #5) located 372-yards west of the Black River crossing. The buried surface encountered in each trench was very marshy and likely would have been unsuitable for human occupation or encampment. The area has also been disturbed by earlier construction. Neither evidence of prehistoric occupation nor potential historic artifacts were found. Therefore the potential for archaeological resources is low.

What Do Archaeologists Mean When They Use the Word Disturbed?

Areas where an event or action has occurred that changed the context of materials within a site, such as moving and mixing materials between layers of soil. Some causes of disturbance are farming, heavy construction, rodent burrowing, and natural forces such as floods. Important archaeological resources are less likely to be found in disturbed areas.

What is Deep Testing?

The use of specialized equipment and methods to test for cultural deposits that may be buried in the ground beyond the limits of normal testing methods. Some tools used to conduct deep testing are backhoes and augers. This work is usually directed by a soil specialist such as a geomorphologist.

What is a Geomorphologist?

A person who studies the characteristics, origin, and development of landforms.

Additionally, SHPO stated in a letter dated September 18, 2003 that MDOT would need to conduct an archaeological survey for the route of the proposed new connector road along with the footprint of the potential new plaza for the Township Alternative. A portion of the area has been developed into an MDOT facility and is already disturbed. In September 2005, Study Team Archaeologists surveyed some of the undisturbed areas that would be impacted by the Township Alternative including the median area between the eastbound and westbound lanes of I-94/I-69 and 62 acres of the proposed plaza site for the Township Alternative. MDOT could not obtain permission to survey the remaining portions of the potential plaza site for the Township Alternative from the property owner. The survey consisted of a walkover by two archaeologists and shovel probes at key locations. No artifacts were discovered in this survey and the archaeologists concluded that there would be a low probability of finding any archaeological resources in the Study Area.

3.15.4 Will the Alternatives Affect Historic Properties?

The following paragraphs discuss the potential effects of the Alternatives on cultural resources. Potential effects on historic properties and archaeological sites are discussed separately.

The historic survey described above found only one property within the Area of Potential Effect, the E.C. Williams House, eligible for the National Register of Historic Places.

No-Build Alternative: The No-Build Alternative will have no effect on the E.C. Williams House.

City East Alternative: The City East Alternative would not take any of the E.C. Williams House property, so there would be no direct impact on the house or yard, located at 2511 10th Avenue. For the City East Alternative, the reconstruction of the plaza would have a number of indirect effects on the property. The house currently is located on a small urban lot, surrounded on all sides by smaller residential properties of varying ages and levels of repair. The E.C. Williams House is more than a full block away from the existing bridge plaza. This block (bounded by Church Street on the north, 10th

Avenue on the east, Elmwood Street on the south, and Pine Grove Avenue on the west), provides a visual buffer between the existing plaza and the house. The neighborhood contains numerous mature trees and is long-established.

The City East Alternative would acquire the block that buffers the house from the existing plaza to accommodate the realignment of Pine Grove Avenue. The houses and businesses located on the south side of Church Street and on the west side of 10th Avenue would be acquired and the block would be converted to landscaped open area and the realigned curve section of Pine Grove Avenue, as shown in **Figure 3.15.1.**

Front View E.C. Williams House

Side View E.C. Williams House

In addition, the automobile dealership on the western half of the block containing the E.C. Williams House would be acquired for the realignment of Pine Grove Avenue. Since the automobile dealership is not contributing to the historic value of the E.C. Williams House, any impacts from MDOT acquiring the dealership property would be neutral to the house.

The realignment of Pine Grove Avenue will bring the traffic noise and glare closer to the E.C. Williams House, though traffic volumes immediately next to the house on 10th Avenue are not anticipated to substantially change. Traffic volumes on Church Street would decline with its closure as a cul-de-sac. The residences on Church Street directly across from the E.C. Williams House would be removed for the plaza buffer. While these residences do not have a direct relationship with the E.C. Williams House, they provide a residential context for the house and some buffer between the existing plaza and the house.

The changes in landscape and traffic will not affect the characteristics that make the E.C. Williams House historically significant. Landscaping and the design of the curve realigning Pine Grove Avenue, if feasible, could minimize its intrusion on the remaining homes in the neighborhood, including the E.C. Williams House. Based on this and the fact

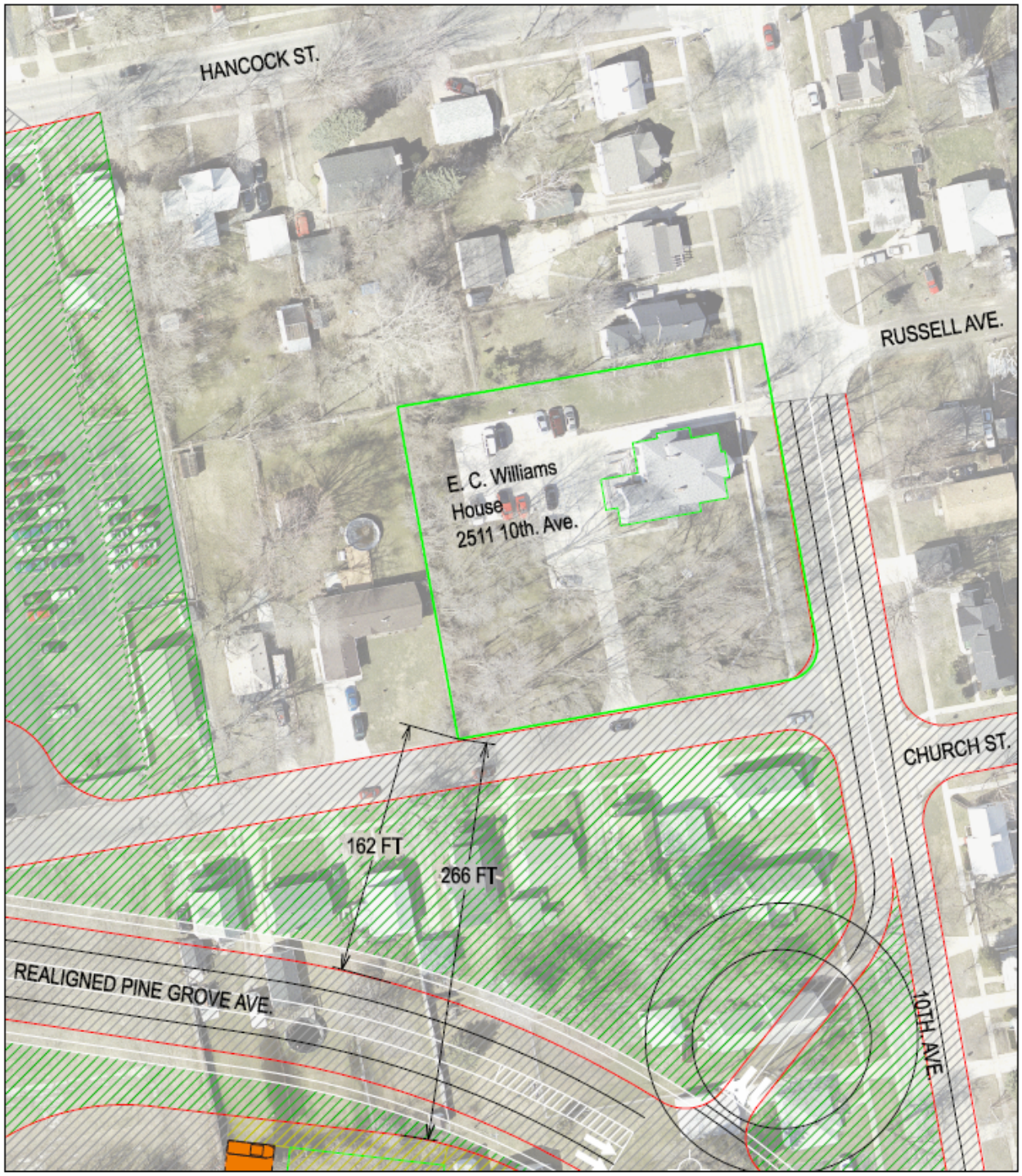
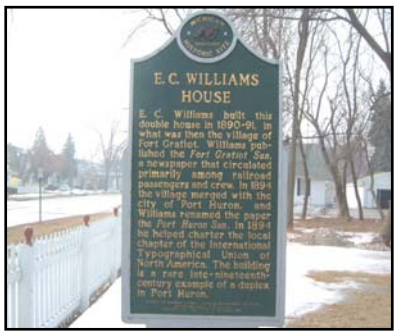


Figure 3.15.1 City East Alternative

that this structure has always been within an urban setting, MDOT has received concurrence, February 1, 2006 from SHPO that the City East Alternative will not adversely affect this property. Although the City East Alternative would not impact the E.C. Williams House, selecting this alternative as the Preferred Alternative is not prudent due to the security and safety concerns related to combining Pine Grove Avenue and 10th Avenue.

City West (Preferred) Alternative: The City West Alternative would directly affect the E.C. Williams House property. Currently, the E.C. Williams House is more than a full block away from the existing bridge plaza. The Preferred Alternative would acquire the block that buffers the house from the existing plaza and the block on which the E.C. Williams House resides. The new northern and eastern boundaries of the plaza would be Hancock Street and 10th Avenue. The houses and businesses located on the south side of Hancock Street, on the north side of Church Street, and on the west side of 10th Avenue would be acquired and the block would be converted to two separate office buildings along with employee and visitor parking (shown in **Figure 3.15.2).**



Historic Marker for E.C. Williams House

Based on the direct impact to the house, MDOT has received concurrence from SHPO on March 15, 2007 that the Preferred Alternative will adversely affect this property. See **Chapter 4.0 Section 4(f) and 6(f) Evaluation** and **Chapter 5.0 Mitigation** for more information. A draft Memorandum of Agreement (MOA) is included in Appendix D.

Township Alternative: The Township Alternative does not propose any new road construction closer to the E.C. Williams House than the current road configuration. The existing plaza would be reconfigured for different use, but would remain within its current footprint.

3.15.5 Will the Alternatives Affect Archaeological Sites?

No-Build Alternative: The No-Build Alternative will have no effect on known archaeological resources.

City East Alternative: The City East Alternative will have no effect on known archaeological resources. All construction would take place within existing disturbed areas.

Figure 3.15.2 City West Alternative

City West (Preferred) Alternative: The Preferred Alternative will have no effect on known archaeological resources. All construction would take place within existing disturbed areas.

Township Alternative: The Township Alternative would create a new plaza facility on mostly open space. A portion of the proposed new plaza area has been developed into an MDOT maintenance facility and is already disturbed.

Archaeological surveys of areas that would be impacted by the Township Alternative found no historic or prehistoric artifacts. The median area between the eastbound and westbound lanes of I-94/I-69 was extensively disturbed during the construction of the freeway and no artifacts were recovered. Archaeologists also found no artifacts during the survey of the 62 acres of the potential plaza site for the Township Alternative and no artifacts were found on the site of the existing MDOT maintenance facility. Study Team archaeologists concluded that there is a low probability of finding any archaeological resources in the areas that would be impacted by the Township Alternative. Based on this information, MDOT received concurrence on February 1, 2006 from SHPO that the Township Alternative would have no adverse effect on archaeological resources. No further archaeological investigations are recommended. In the event of an archaeological discovery during construction, work will be halted in the area of the discovery and MDOT will coordinate with SHPO regarding the find.